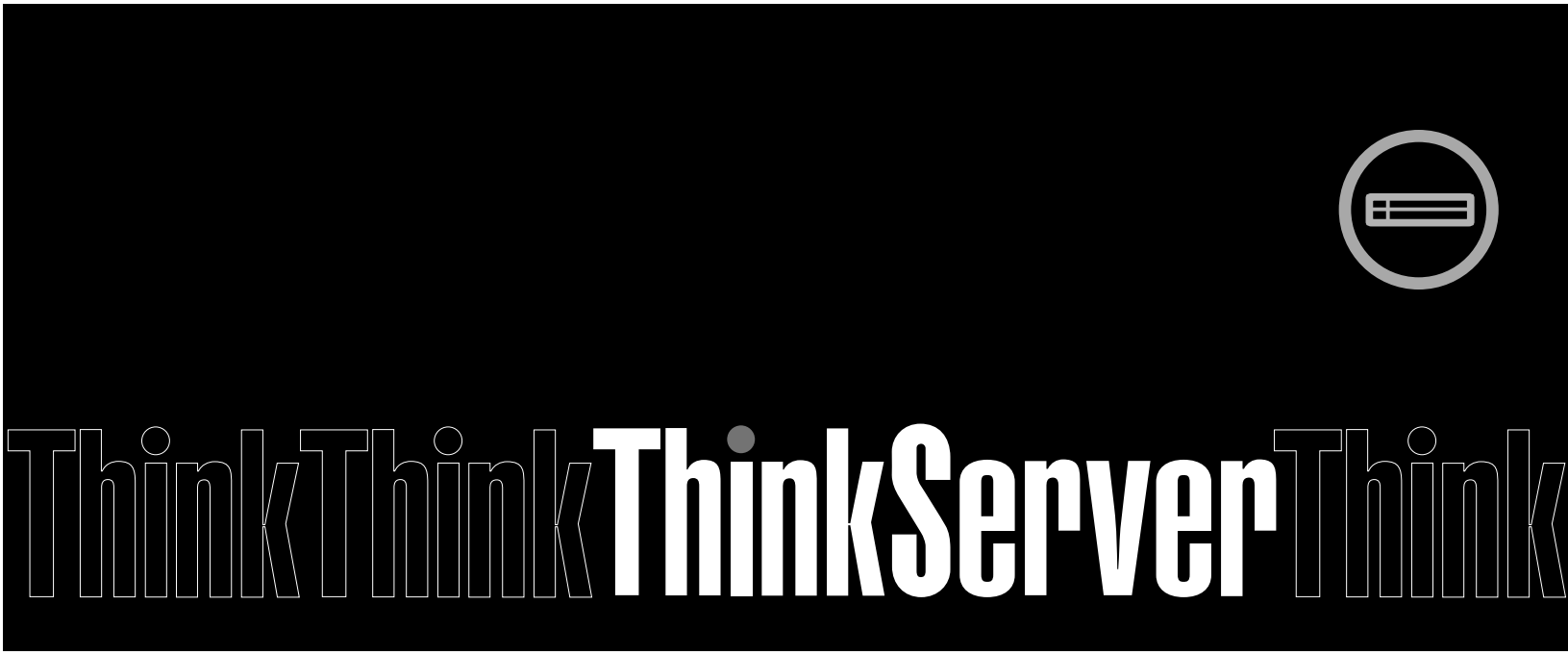
lenovo

ThinkServer
Installation and User Guide



Machine Types: 1045, 1046, 1047, and 1048

Note

Before using this information and the product it supports, be sure to read and understand the following:

- The *Important Notices* that comes with your product
- The *Safety Information* and the *Warranty and Support Information* on the documentation DVD that comes with your product
- Appendix C “Notices” on page 107

Second Edition (February 2011)

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Safety information

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

Antes de instalar este produto, leia as Informações de Segurança.

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας (safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

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在安装本产品之前，请仔细阅读 Safety Information（安全信息）。

安裝本產品之前，請先閱讀「安全資訊」。

Important: Each caution and danger statement in this document is labeled with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information* manual. For example, if a caution statement is labeled “Statement 1,” translations for this caution statement are in the *Safety Information* manual under “Statement 1.”

Be sure to read and understand all caution and danger statements in this document before you perform the procedures. Read and understand any additional safety information that comes with the server or an optional device before you install, remove, or replace the device.

Statement 1

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	**To Disconnect:**
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

Statement 2

CAUTION:
When replacing the lithium battery, use only the battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of. *Do not:*

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

Statement 3

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

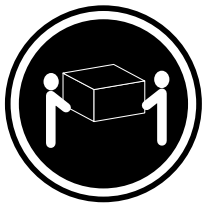
- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

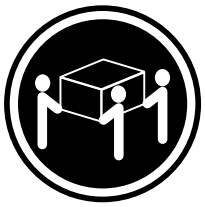
Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

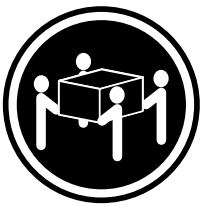
Statement 4



≥ 18 kg (39.7 lb)
< 32 kg (70.5 lb)



≥ 32 kg (70.5 lb)
< 55 kg (121.2 lb)



≥ 55 kg (121.2 lb)
< 100 kg (220.5 lb)

CAUTION:
Use safe practices when lifting.

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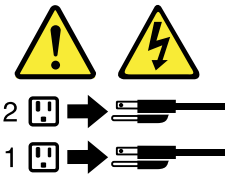
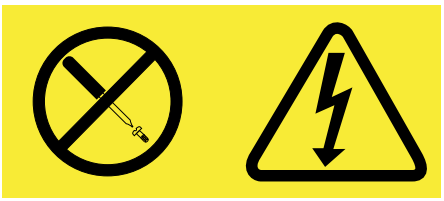
Statement 5

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Statement 8

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.



Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Statement 11

CAUTION:
The following label indicates sharp edges, corners, or joints nearby.

Statement 12

CAUTION:
The following label indicates a hot surface nearby.

Statement 13

DANGER

Overloading a branch circuit is potentially a fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch circuit protection requirements. Refer to the information that is provided with your device for electrical specifications.

Statement 15

CAUTION:
Make sure that the rack is secured properly to avoid tipping when the server unit is extended.

Statement 17

CAUTION:
The following label indicates moving parts nearby.

Statement 26

CAUTION:
Do not place any object on top of rack-mounted devices.

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Chapter 1. General information

This chapter provides some general information about your server.

This chapter contains the following topics:

- "Introduction" on page 1
- "Notices and statements in the document" on page 1
- "Related documentation" on page 2

Introduction

This *Installation and User Guide* is for your Lenovo® ThinkServer® RD240 server (machine types 1045, 1046, 1047, and 1048). This document contains the following information:

- Setting up and cabling the server
- Starting and configuring the server
- Installing options and replacing customer replaceable units (CRUs)
- Solving problems

The server comes with the *ThinkServer EasyStartup* DVD to help you configure the hardware, install device drivers, and install the operating system.

The server comes with a limited warranty. For information about the terms of the warranty and getting service and assistance, see the *Warranty and Support Information* on the documentation DVD that comes with your server.

To obtain the most up-to-date information about the server and other Lenovo products, go to: http://www.lenovo.com/thinkserver

Record information about the server in the following table. You will need this information when you register the server with Lenovo.

Product name	ThinkServer RD240
Machine type	1045, 1046, 1047, or 1048
Model number	_____
Serial number	_____

The model number and serial number are on the labels on the bottom of the server and on the front, visible through the bezel.

Notices and statements in the document

The caution and danger statements that appear in this document are also in the multilingual *Safety Information*. Each caution and danger statement in this document is labeled with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information*. See "Related documentation" on page 2 for detailed information about how to get the various documentation for your server.

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The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid problems or inconvenient situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Related documentation

The documentation DVD that comes with your server contains documentation for the server in Portable Document Format (PDF). To view the documentation on the DVD, you need to have the Adobe Reader 5.0 program or later installed.

The following table provides information about the general descriptions of the various documentation provided with your server and how to obtain all the documentation.

Table 1. Related documentation for the server

Documentation	Description	Location
Hardware Maintenance Manual	This document provides diagnostic information, parts listing, replacement procedures for all CRUs, and replacement procedures for other field replaceable units (FRUs) replaced by trained service personnel.	This document is in English and posted on the Lenovo Support Web site at http://www.lenovo.com/support.
Important Notices	This document includes safety and legal notices that you are expected to read before using the server.	This document is printed out and provided in server packaging.
Rack Installation Instructions	This document provides instructions on how to install your server in a rack.	The English version of this document is printed out and provided in the server packaging. Additional languages are provided on the *ThinkServer Documentation DVD* and on the Lenovo Support Web site: http://www.lenovo.com/support
Read Me First	This document directs you to the *ThinkServer Documentation DVD* for complete warranty and support information.	This document is printed out and provided in server packaging.
Safety Information	This document includes translations of all safety statements used in the ThinkServer documentation.	Available on the *ThinkServer Documentation DVD*
Warranty and Support Information	This document includes the warranty statement and information about how to contact Lenovo Support.	Available on the *ThinkServer Documentation DVD*
Note: You can obtain all the documentation in PDF for your server from the Lenovo Support Web site at: http://www.lenovo.com/support		

Chapter 2. Server setup road map

This chapter provides a general road map to guide you through setting up your server.

The server setup procedure varies depending on the configuration of the server when it was delivered. In some cases, the server is fully configured and you just need to connect the server to the network and an electrical outlet, and then you can turn on the server. In other cases, the server needs to have hardware features installed, requires hardware and firmware configuration, and requires the operating system to be installed.

Table 2. Server setup road map

Task	Where to find the information
Unpack	Chapter 3 “Features and technologies” on page 5
Install hardware	Chapter 5 “Installing, removing, or replacing hardware” on page 17
Install the server in the rack	The *Rack Installation Instructions* manual is printed and also included on the *ThinkServer Documentation DVD*.
Connect the Ethernet cable and power cord	“Rear view” on page 10
Turn on the server to verify operation	“Turning on the server” on page 66
Review the BIOS settings and customize as needed	“Starting the Setup Utility program” on page 70
Configure RAID (onboard SATA RAID or the installed SAS RAID adapter)	“RAID controllers” on page 78
Check for firmware updates	“Using the EasyUpdate Firmware Updater program” on page 84
Install operating system and basic drivers	“Using the ThinkServer EasyStartup program” on page 79
Install any additional drivers needed for added features	Refer to the instructions that came with the hardware option.
Configure Ethernet settings in the operating system	See the operating system help. This step is not required if the operating system was installed using the ThinkServer EasyStartup program.
Install remote management applications	“Installing the ThinkServer EasyManage program” on page 85
Install applications	Refer to the documentation that comes with the applications that you want to install.

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Chapter 3. Features and technologies

What is included with your server

The RD240 server package includes the server, a power cord, documentation, the *ThinkServer Documentation DVD*, and software media.

Features

The RD240 server offers the following features and technologies:

- **Microprocessor(s):** The server supports up to two Intel® Xeon® dual-core, quad-core, or hex-core microprocessors.
- **BIOS:** The server firmware defines a standard interface between the operating system, platform firmware, and external devices.
- **EasyStartup DVD:** The ThinkServer EasyStartup program guides you through the configuration of the hardware, the RAID controller, and the installation of the operating system and device drivers.
- **Integrated network support:** The server comes with two integrated single-port Gigabit Ethernet controllers and each supports connection to a 10 Mbps, 100 Mbps, or 1000 Mbps network. For more information, see “Configuring the Gigabit Ethernet controller” on page 84.
- **Large data-storage capacity and hot-swap capability:** Some hot-swap server models support eight 3.5-inch hot-swap hard disk drives. With the hot-swap feature, you can add, remove, or replace hard disk drives without turning off the server.
- **Large system-memory capacity:** The server supports up to 64 GB of system memory. The memory module supports error correcting code (ECC) for up to eight industry-standard single-rank or dual-rank, 1333 MHz, DDR3 (third-generation double-data-rate) registered synchronous dynamic random access memory (SDRAM) dual inline memory modules (DIMMs).
- **High-performance graphics controller:** The server comes with an onboard high-performance graphics controller that supports high resolutions and includes many performance-enhancing features for the operating-system environment.
- **Redundant connection:** The two onboard network interface controllers (NIC) provide a failover capability to a redundant Ethernet connection. If a problem occurs with the primary Ethernet connection, all Ethernet traffic that is associated with the primary connection is automatically switched to the redundant NIC. If the applicable device drivers are installed, this switching occurs without data loss and without user intervention.
- **Intelligent Platform Management Interface (IPMI) 2.0:** The command-line interface provides direct access to server management functions through the IPMI 2.0 protocol. Use the command-line interface to issue commands to control the server power, view system information, and identify the server. You can also save one or more commands as a text file and run the file as a script.
- **RAID support:** The server supports an integrated 1068E SAS RAID controller and an add-on SAS RAID card (ThinkServer 8708ELP SAS RAID Adapter or ThinkServer 8708EM2 RAID Adapter), which are required for you to use the hot-swap SAS or SATA hard disk drives and to create the redundant array of independent disks (RAID) configurations.

Specifications

The following information is a summary of the features and specifications of the server. Depending on the server model, some features might not be available, or some specifications might not apply.

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Table 3. Features and specifications

Microprocessor(s): Supports up to two Intel Xeon dual-core, quad-core, or hex-core microprocessors. For the specific type and speed information about the microprocessor, use the Setup Utility program. See “Using the Setup Utility program” on page 69. For a list of the supported microprocessors for your server, go to http://www.lenovo.com/thinkserver. On the ThinkServer systems page, click **Products → Options → ThinkServer Processors**. **Memory modules:** • Minimum system memory: 2 GB • Maximum system memory: 64 GB (eight memory slots, each with one 8 GB RDIMM installed) • Types: ECC, 1333 MHz, DDR3 registered SDRAM DIMMs only • Slots: Eight dual inline memory module (DIMM) slots • Supports 2 GB, 4 GB, and 8 GB RDIMMs **Integrated graphics card:** • 8 MB video memory **Size:** • Height: 87.5 mm (3.45 inches) • Width: 448 mm (17.64 inches) • Depth: 683 mm (26.89 inches) • Maximum weight: 30 kg (66.14 lb) when fully configured	**Optical drive:** • Slim DVD/RW **Hard disk drive expansion bays (depending on the model):** Up to eight 3.5-inch SATA or SAS hard disk drives **Expansion slots:** • One PCI Express x16 card slot on the system board for a riser card (there are three PCI Express x8 card slots on the riser card) **Power supply:** 750-watt single power supply / 750-watt redundant power supply **System fans:** Four system fans with automatic energy-saving, noise reduction technology **Integrated functions:** • Two single-port Gb Ethernet controllers • Six USB 2.0 connectors (two front and four rear) • Two RJ-45 Ethernet connectors • One serial port • One Video Graphics Array (VGA) monitor connector	**Environment:** • Air temperature: – Server on: 10°C to 35°C (50°F to 95°F); altitude: 0 to 914.4 m (3 000 ft) – Server off: 10°C to 43°C (50°F to 109.4°F); maximum altitude: 2 133.6 m (7 000 ft) – Shipping: -40°C to 60°C (-104°F to 140°F) • Humidity: – Server on: up to 80%, non-condensing – Server off: up to 80%, non-condensing – Shipping and storage: up to 93%, non-condensing • Particulate contamination: **Attention:** Airborne particulates and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server.

Table 3. Features and specifications (continued)

RAID adapters:	**Electrical input**	**Notes:**
• Onboard 1068E SAS RAID adapter • ThinkServer 8708ELP SAS RAID Adapter • ThinkServer 8708EM2 RAID Adapter	• Input voltage: – Low range: Minimum: 100 V ac Maximum: 127 V ac Input frequency range: 50 to 60 Hz – High range: Minimum: 200 V ac Maximum: 240 V ac Input frequency range: 50 to 60 Hz	1. Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use. 2. The sound levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The noise emission level stated is the declared (upper limit) sound-power level, in bels, for a random sample of system. 3. There is no keyboard connector or mouse connector on the server. You can connect a USB keyboard and USB mouse to the server by using the USB connectors.

Software programs

Lenovo provides software to help get your server up and running.

EasyStartup

The ThinkServer EasyStartup program simplifies the process of configuring RAID and installing supported Microsoft® Windows® and Linux operating systems and device drivers on your server. The EasyStartup program is provided with your server on the *ThinkServer EasyStartup* DVD. The DVD is self-starting (bootable). The user guide for the EasyStartup program is on the DVD and can be accessed directly from the program interface. For additional information, see “Using the ThinkServer EasyStartup program” on page 79.

EasyManage

The ThinkServer EasyManage Agent enables this server to be managed by the centralized console of an EasyManage Core Server over the network. The ThinkServer EasyManage Agent is supported on 32-bit and 64-bit Windows, Red Hat, and SUSE operating systems.

Reliability, availability, and serviceability

Reliability, availability, and serviceability (hereafter referred to as RAS) are three important server design features. The RAS features help you to ensure the integrity of the data stored on the server, the availability of the server when you need it, and the ease with which you can diagnose and correct problems.

The server has the following RAS features:

- Advanced Configuration and Power Interface (ACPI)
- Advanced Desktop Management Interface (DMI)
- Automatic memory downsizing on error detection
- Automatic restart on non-maskable interrupt (NMI)
- Availability of microcode level
- Built-in, menu-driven setup, system configuration, and RAID configuration
- Built-in monitoring for fan, temperature, and voltage
- Cooling fans with speed-sensing capability
- ECC DDR3 SDRAM with Serial Presence Detect (SPD)
- Error codes and messages to help you identify problems
- Generating error logs for the power-on self-test (POST) failures
- Hot-swap SAS hard disk drives
- Integrated Ethernet controllers
- Intelligent Platform Management Interface (IPMI) 2.0
- Power-on self-test (POST)
- Redundant Ethernet connection with failover capability (requires an optional Ethernet card)
- Standby voltage for system-management features and monitoring
- System-error light-emitting diode (LED) on the front panel
- Vital product data (VPD), including the serial number information and replacement part numbers, stored in the nonvolatile memory for easier remote maintenance

Chapter 4. Locating parts, controls, LEDs, and connectors

This chapter provides information to help you locate your server parts, controls, light-emitting diodes (LEDs), and connectors.

Front view

The following illustration shows the drives and parts on the front of the server.

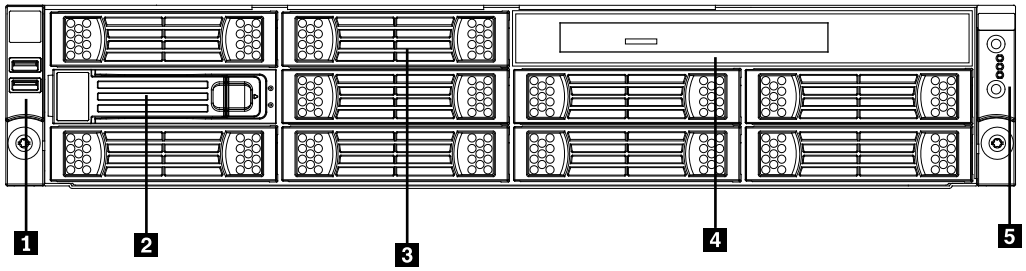

Figure 1. Front view of the server with eight hard disk drives and an optical drive

1 Left handle of the chassis

2 3.5-inch hard disk drive bay

3 3.5-inch hard disk drive dummy bay

4 Optical drive

5 Front control panel (see “Front control panel” on page 11)

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Rear view

The following illustration shows the locations of the connectors and parts on the rear of the server.

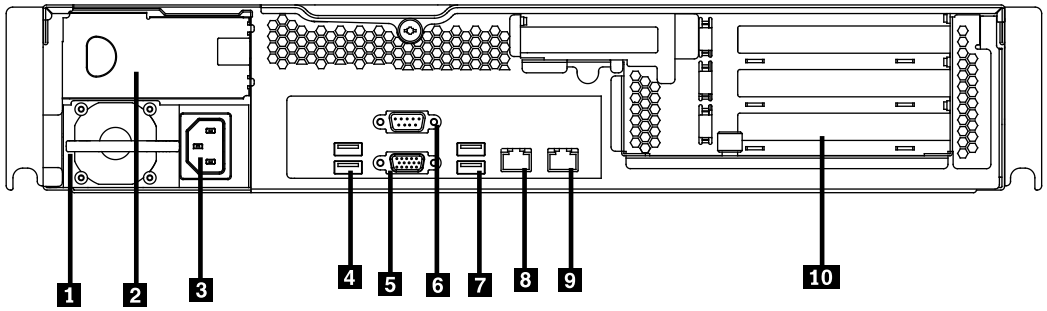

Figure 2. Rear view of the server

1 Power supply 1	**6** Serial port
2 Power supply 2 bay (blank and covered by a bay bezel)	**7** USB connectors (3 and 4)
3 Power cord connector	**8** Ethernet connector 1
4 USB connectors (1 and 2)	**9** Ethernet connector 2 (share with MGMT)
5 VGA monitor connector	**10** PCI expansion slot

Connector	Description
Power cord connector	Used to connect the power cord.
Ethernet connector	Used to attach an Ethernet cable for a local area network (LAN).
Serial port	Used to attach a device that uses a 9-pin serial port.
USB connector	Used to attach a device that uses a USB connector, such as a USB keyboard or a USB mouse.
VGA monitor connector	Used to attach a VGA monitor or other devices that use a VGA monitor connector.

Front control panel

This section provides information about the front control panel of the server.

The following illustration helps you identify the connectors, controls, and LEDs on the front control panel of your server.

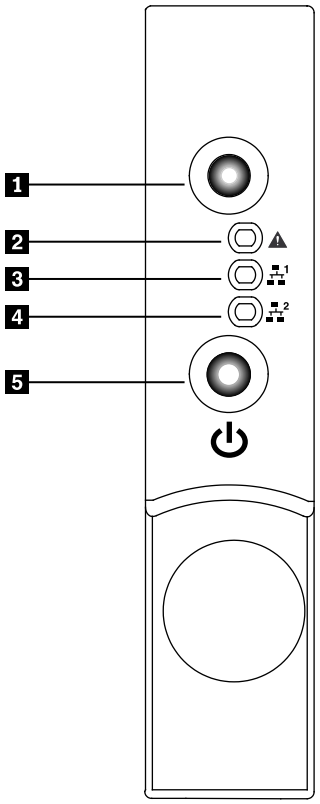

Figure 3. Front control panel

1 ID button and LED
2 System status LED
3 Ethernet 1 status LED
4 Ethernet 2 status LED
5 Power button and LED

The following table describes the meaning of the LEDs on the front control panel.

Table 4. Front control panel LEDs

LED	State	Color	Description
ID LED	On	Blue	ID is on.
	Off	Off	ID is off.
System status LED	Off	Off	System is normal.
	On	Red	• Fan alarm • Voltage alarm • Temperature alarm

Table 4. Front control panel LEDs (continued)

LED	State	Color	Description
Ethernet 1 status LED	Blinking	Green	LAN is active and data is being transferred.
	On	Green	LAN is connected.
	Off	Off	LAN is not connected.
Ethernet 2 status LED	Blinking	Green	LAN is active and data is being transferred.
	On	Green	LAN is connected.
	Off	Off	LAN is not connected.
Power status LED	On	Green	Power is on.
	Blinking	Green	The server power is under S1 mode.
	Off	Off	Power is off.

Each hard disk drive also has two status LEDs. Status LED 1 (top) indicates presence (whether the drive is recognized by the system) and Status LED 2 (bottom) indicates drive activity.

Table 5. Hard disk drive status LEDs for the onboard 1068E SAS RAID adapter and add-on SAS RAID adapter configurations

Description	Hard disk drive status LED 1	Hard disk drive status LED 2
Hard disk drive is not present.	Off	Off
Hard disk drive is present but is not active.	Off	Green (for SATA hard disk drives, the status is Off)
Hard disk drive is present and active.	Off	Blinking green
Server is in the process of locating the hard disk drive.	Blinking green	Green
Hard disk drive has failed.	Red	Green
RAID is rebuilding.	Blinking red	Green

The Ethernet 1 and Ethernet 2 connectors have two status LEDs that indicate the LAN connection and activity of the connection.

Table 6. Ethernet LEDs

LED	State	Color	Description
RJ-45 linkage/activity (left)	On	Green	10/100/1000 Mb linked
	Blinking	Green	10/100/1000 Mb activity
	Off	Off	No LAN connection.
RJ-45 speed (right)	On	Amber	1000 Mb linked and active
	On	Green	100 Mb linked and active
	Off	Off	10 Mb mode or no LAN connection.

Locating server components

The following illustration shows the locations of the major components in your server.

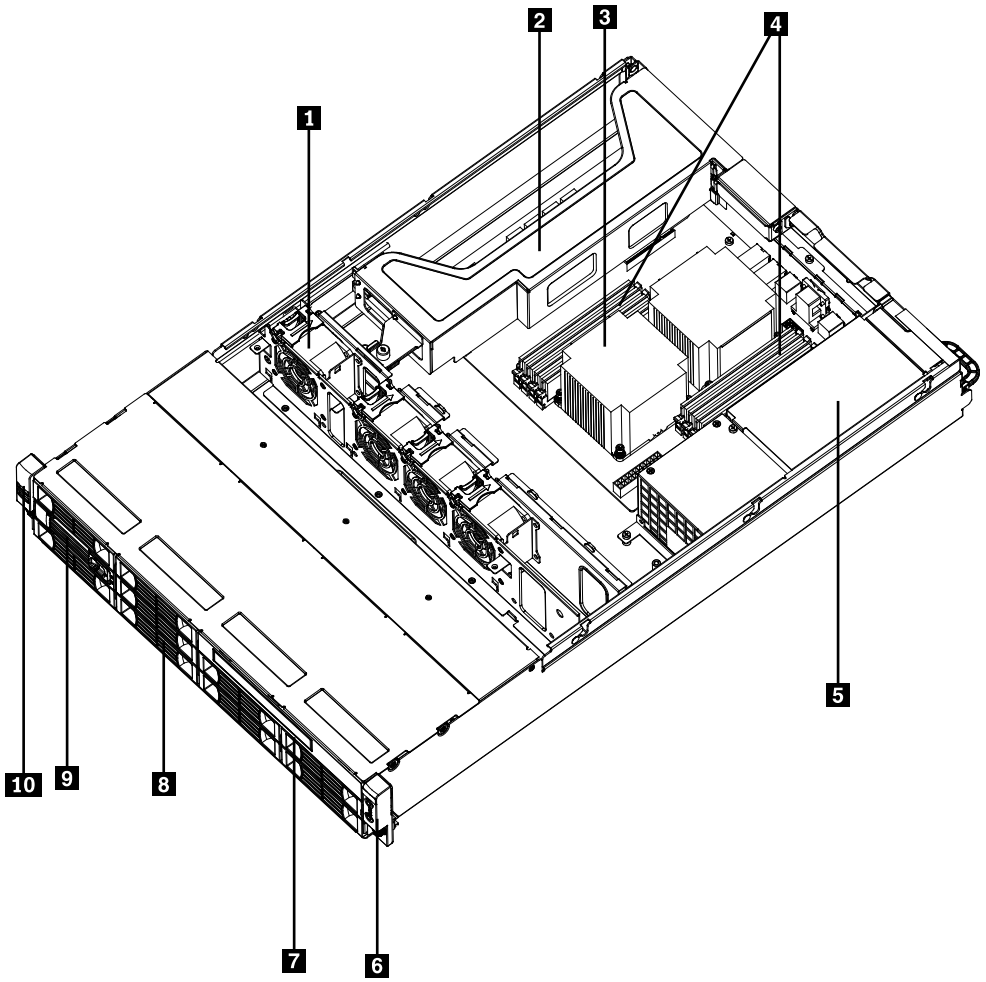

Figure 4. Server component locations

1 System fans	6 Front control panel (see “Front control panel” on page 11)
2 Riser card assembly	7 Optical drive (depending on the model)
3 Microprocessor and heat sink	8 3.5-inch hard disk drive dummy bay
4 Memory modules	9 3.5-inch hard disk drive
5 Power supply assembly	10 Left handle of the chassis

Locating parts on the system board

The following illustrations show the locations of the parts on the system board.

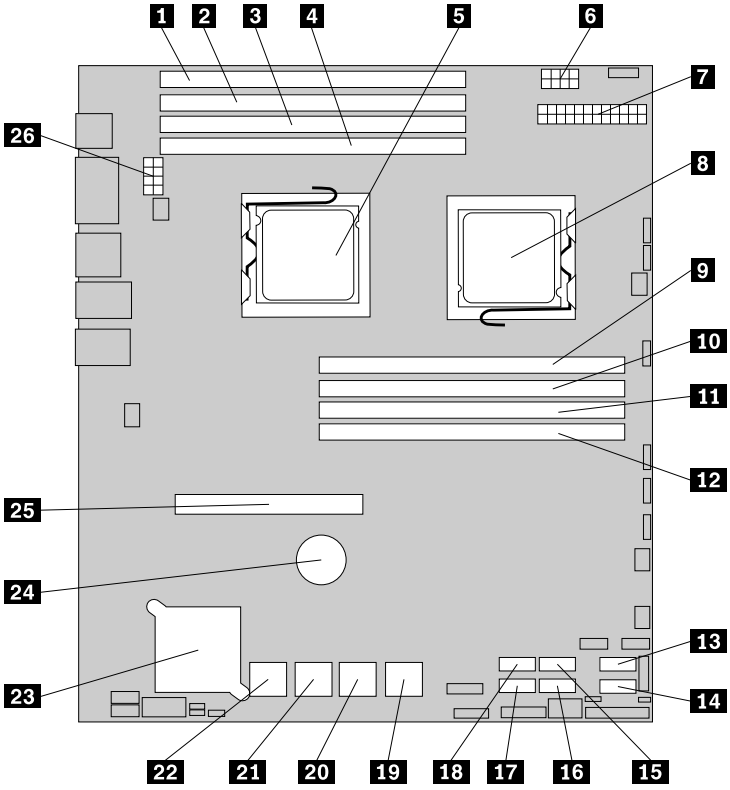

Figure 5. Locating major parts on the system board

1 Memory slot (CPU1 DIMM CHC0)
2 Memory slot (CPU1 DIMM CHB0)
3 Memory slot (CPU1 DIMM CHA0)
4 Memory slot (CPU1 DIMM CHA1)
5 Microprocessor (CPU1)
6 Power connector 2 (for CPU0)
7 24-pin power connector for the system board
8 Microprocessor (CPU0)
9 Memory slot (CPU0 DIMM CHA1)
10 Memory slot (CPU0 DIMM CHA0)
11 Memory slot (CPU0 DIMM CHB0)
12 Memory slot (CPU0 DIMM CHC0)
13 SATA connector 0
14 SATA connector 1
15 SATA connector 2
16 SATA connector 3
17 SATA connector 5
18 SATA connector 4
19 SAS connectors (top: SAS 1; bottom: SAS 0)
20 SAS connectors (top: SAS 3; bottom: SAS 2)
21 SAS connectors (top: SAS 5; bottom: SAS 4)
22 SAS connectors (top: SAS 7; bottom: SAS 6)
23 Onboard 1068E SAS RAID controller
24 System board battery
25 PCI Express x16 card slot (for a riser card)
26 Power connector 3 (for CPU1)

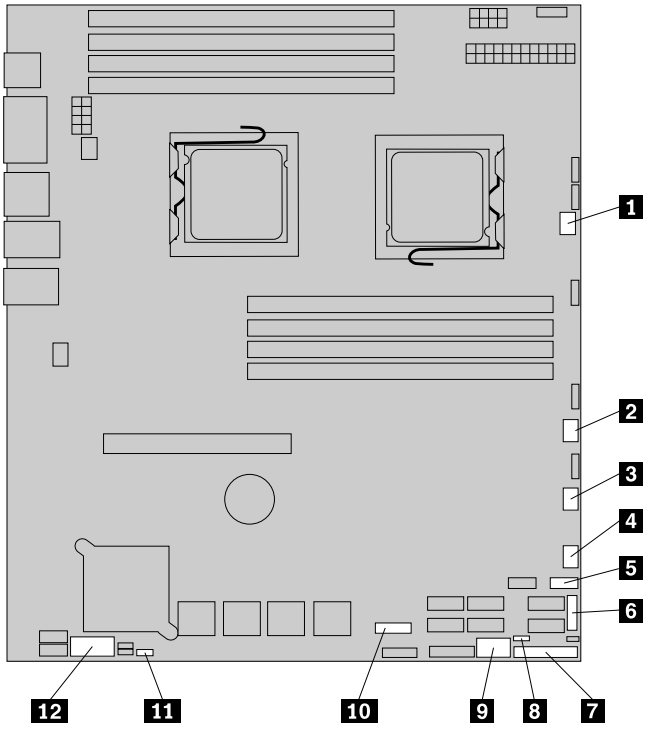

Figure 6. Locating other connectors on the system board

1 System fan 1 connector
2 System fan 2 connector
3 System fan 3 connector
4 System fan 4 connector
5 Front USB connector
6 J51 (SGPIO connector for onboard SAS port 1-4)
7 J35 (for front control cable)
8 JP1 (clear CMOS)
9 USB 2 connector
10 J21 (SGPIO connector for onboard SAS port 5-8)
11 JP7 (set onboard SAS)
12 J16 (COM2 connector)

The following table introduces the jumper switches on the system board.

Table 7. Jumper settings

Jumper	Position	Description
JP1: Clear CMOS	Pins 1-2	The default position at which the jumper is placed on pins 1-2 during the normal operation of the system.
	Pins 2-3	If the jumper is placed on pins 2-3, when the jumper is moved back to the default positions and at the next startup, the settings of CMOS will be cleared automatically.
JP7: Set Onboard SAS	Pins 1-2	The default position at which the jumper is placed on pins 1-2 during the normal operation of the system. The onboard SAS controller is Enabled.
	Pins 2-3	If the jumper is placed on pins 2-3, the onboard SAS controller is Disabled.

Note: Before clearing the CMOS, turn off the server and disconnect the power cord. Move the jumper from pins 1-2 to pins 2-3. Wait more than five minutes and then move the jumper back to the normal position (pins 1-2) to clear CMOS.

Locating connectors on the backplane

The following illustration shows the connector locations on the backplane.

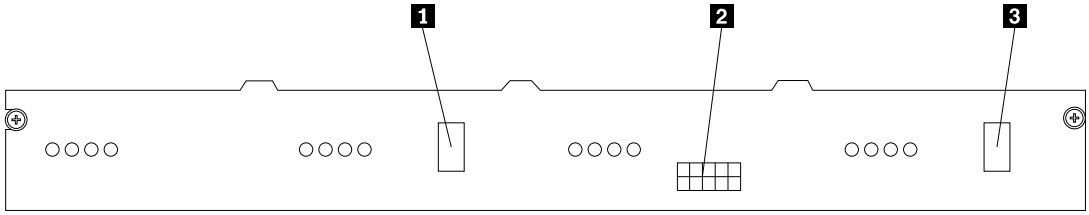

Figure 7. Backplane connector locations

1 Mini SAS signal connector 2

2 Power connector

3 Mini SAS signal connector 1

Chapter 5. Installing, removing, or replacing hardware

This chapter provides instructions on how to install, remove, or replace hardware for your server.

This chapter contains the following topics:

- "Guidelines" on page 17
- "Removing the server cover" on page 19
- "Installing, removing, or replacing optional hardware devices" on page 20
- "Installing, removing, or replacing hardware devices" on page 38
- "Completing the parts replacement" on page 65

Guidelines

This section provides some guidelines that you should read and understand before using your server.

Basic guidelines

Before you use the server, be sure to read and understand the following guidelines:

- Be sure to read and understand the *Safety Information* and the *Warranty and Support Information* on the documentation DVD that comes with your product, and "Guidelines" on page 17. These information will help you work safely. To obtain a copy of the publications, go to:
  http://www.lenovo.com/support
- When you install your new server, take the opportunity to download and apply the most recent firmware updates. This step will help you to ensure that any known issues are addressed and the server is ready to function at optimal performance. To download firmware updates for your server, do the following:
  1. Go to http://www.lenovo.com/support.
  2. Click **Download & Drivers → ThinkServer** and then follow the instructions on the Web page to download firmware updates for your server.
- Observe good housekeeping in the area where you are working. Put removed covers and other parts in a safe place.
- If you must turn on the server while the server cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  - Make sure that you can stand safely without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to drives.
- Have a small flat-blade screwdriver available.
- To view the error LEDs on the system board and internal components, leave the server connected to power.

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- You do not have to turn off the server to install or replace hot-swap fans, redundant hot-swap ac power supplies, or hot-plug USB devices. However, you must turn off the server before performing any steps that involve installing, removing, or replacing adapter cables or non-hot-swap optional devices or components.
- After completing any installation, removal, or replacement procedure, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported optional devices for the server, go to http://www.lenovo.com/thinkserver.
- When working inside the server, you might find some tasks easier if you lay the server on its side.

System reliability guidelines

To help ensure proper cooling and system reliability, make sure that you follow these guidelines:

- Every drive bay has an internal drive installed or an Electro Magnetic Compatibility (EMC) shield installed.
- If the server has redundant power, every power supply bay has a power supply assembly installed.
- Leave adequate space around the server to make sure that the server cooling system works well.
- Properly route the cables. For some options, such as PCI cards, follow the cabling instructions that come with the options.
- Make sure that you replace a failing fan within 48 hours.
- When replacing a hot-swap drive, install the new hot-swap drive within two minutes of removal.
- Do not remove any air duct or air baffles while the server is running. Operating the server without the air duct or air baffles might cause the microprocessor to overheat.
- The second microprocessor socket always contains either a microprocessor socket cover or a microprocessor.

Handling static-sensitive devices

Attention:
Do not open the static-protective package containing the new part until the defective part has been removed from the server and you are ready to install the new part. Static electricity, although harmless to you, can seriously damage server components and parts.

When you handle server parts and components, take these precautions to avoid static-electricity damage:

- Limit your movement. Movement can cause static electricity to build up around you.
- Wear an electrostatic-discharge wrist strap, if one is available.
- Always carefully handle the parts and other components (such as PCI cards, memory modules, system boards, and microprocessors) by its edges or its frame. Do not touch solder joints, pins, or exposed circuitry.
- Prevent others from touching the parts and other computer components.
- Before you replace a new part, touch the static-protective package containing the new part to a metal expansion-slot cover or other unpainted metal surface on the server for at least two seconds. This reduces static electricity from the package and your body.
- Remove the new part from the static-protective package and directly install it in the server without placing it on any other surface. If it is hard for you to do this in your specific situation, place the static-protective package of the new part on a smooth, level surface, and then place the new part on the static-protective package.
- Do not place the part on the server cover or other metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Working inside the server with the power on

Attention:
Static electricity that is released to internal server components when the server is turned on might cause the server to halt, which might result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when you work inside the server with the power on.

The server supports hot-swap devices and is designed to operate safely while it is turned on and the cover is removed. Follow these guidelines when you work inside the server with the power on:

- Avoid wearing loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the server; do not wear cuff links while you are working inside the server.
- Do not allow your necktie or scarf to hang inside the server.
- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting wrist watches.
- Remove items from your shirt pocket, such as pens and pencils. These items might fall into the server as you lean over it.
- Avoid dropping any metallic objects into the server, such as paper clips, hairpins, and screws.

Removing the server cover

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 17.

This section provides instructions on how to remove the server cover.

To remove the server cover, do the following:

1. Remove all media from the drives. Then, turn off all attached devices and the server.
2. Disconnect all power cords from electrical outlets.
3. Disconnect the power cord(s), Input/Output (I/O) cables, and all other cables that are connected to the server.

4. Loosen the thumbscrew in the rear of the server cover 1. Then, slide the server cover to the rear until you can lift it up to completely remove it from the chassis 2.

   Notes:

   a. The thumbscrew is securely installed and you need to use a tool, such as a screwdriver, to loosen it.

   b. The thumbscrew is an integrated part of the server cover and it cannot be removed from the server cover.

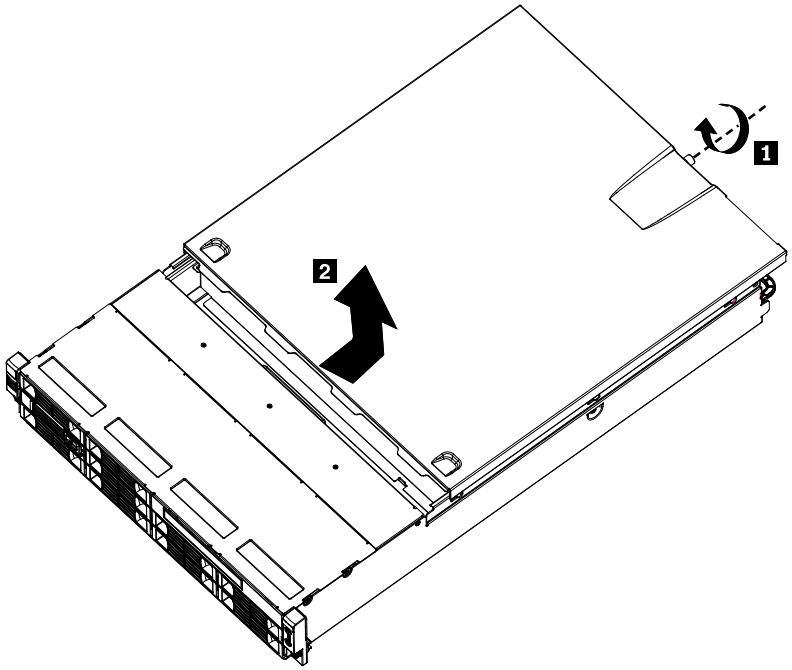


Figure 8. Removing the server cover

Attention: For proper cooling and airflow, install the server cover before turning on the server. Operating the server for more than 30 minutes with the server cover removed might damage server components.

To reinstall the server cover, see “Installing the server cover” on page 65.

Installing, removing, or replacing optional hardware devices

This section provides instructions on how to install, remove, or replace optional hardware devices for your server. You can expand the capabilities of your server by adding memory modules, PCI cards, or drives, and maintain your server by replacing the failing optional hardware devices. If you are replacing an optional hardware device, perform the removal procedure and then perform the installation procedure for the optional hardware device that you want to replace.

Installing or removing a memory module

This section provides instructions on how to install or remove a memory module. For a list of the supported memory modules for your server, go to http://www.lenovo.com/thinkserver. On the ThinkServer systems page, click **Products → Options → ThinkServer Memory**.

Memory module installation rules

Your server has eight memory slots for installing or replacing DDR3 SDRAM DIMMs that provide up to a maximum of 64 GB of system memory.

The following tables provide information about the memory module installation rules that you should consider when installing a memory module. The "X" mark indicates the suggested memory slot(s) into which the memory module(s) should be installed in different situations. The number, for example 1, 2, or 3, indicates the installation sequence. See "Locating parts on the system board" on page 14 to identify the various memory slots.

Note: All memory module types and capacities must be consistent.

Table 8. DIMM installation rules when a single microprocessor (CPU0) is installed

DIMM slot	One DIMM	Two DIMMs	Three DIMMs	Four DIMMs
CPU0 DIMM CHA1				X, 4
CPU0 DIMM CHA0	X	X, 1	X, 1	X, 1
CPU0 DIMM CHB0		X, 2	X, 2	X, 2
CPU0 DIMM CHC0			X, 3	X, 3
Note: Installing DIMMs on channel A and channel B of CPU0 should enable Channel Mirroring Mode. This mode requires that you install the DIMMs in pair, and the DIMM installation for Channel Mirroring Mode is one DIMM on CPU0 DIMM CHA0 and one DIMM on CPU0 DIMM CHB0 when a single microprocessor (CPU0) is installed.				

Table 9. DIMM installation rules when two microprocessors (CPU0 and CPU1) are installed

DIMM slot	Two DIMMs	Four DIMMs	Six DIMMs	Eight DIMMs
CPU0 DIMM CHA1				X, 7
CPU0 DIMM CHA0	X, 1	X, 1	X, 1	X, 1
CPU0 DIMM CHB0		X, 3	X, 3	X, 3
CPU0 DIMM CHC0			X, 5	X, 5
CPU1 DIMM CHA1				X, 8
CPU1 DIMM CHA0	X, 2	X, 2	X, 2	X, 2
CPU1 DIMM CHB0		X, 4	X, 4	X, 4
CPU1 DIMM CHC0			X, 6	X, 6
Note: For the Channel Mirroring Mode, it requires that you install the DIMMs in pair, and the DIMM installation for Channel Mirroring Mode when two microprocessors (CPU0 and CPU1) are installed is shown below. Follow this sequence rather than the sequence listed above if you want to use the Channel Mirroring Mode. 1. Pair 1: install a DIMM on CPU0 DIMM CHA0 and then install a DIMM on CPU0 DIMM CHB0. 2. Pair 2: install a DIMM on CPU1 DIMM CHA0 and then install a DIMM on CPU1 DIMM CHB0.				

Installing a memory module

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to install a memory module.

To install a memory module, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See “Removing the server cover” on page 19.
3. Locate the appropriate memory slot on the system board into which you will install the memory module. To optimize system performance, follow the related memory module installation rules and install the memory module into a memory slot starting with the memory module farthest from the microprocessor. See “Memory module installation rules” on page 21.
4. Open the retaining clips of the memory slot into which you want to install the memory module.

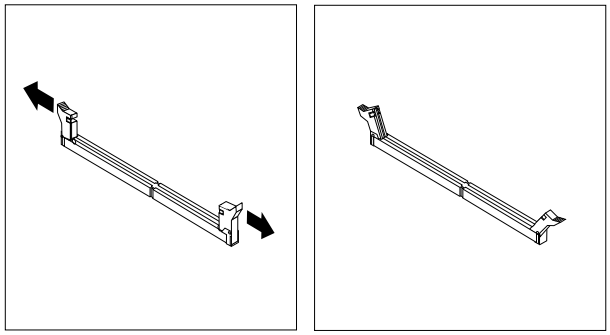


Figure 9. Opening the retaining clips of the memory slot

5. Touch the static-protective package that contains the new memory module to any unpainted metal surface on the outside of the server. Then, remove the new memory module from the package.
6. Position the new memory module over the memory slot. Make sure that the notch **1** on the new memory module is aligned with the key **2** in the memory slot. Then, press the new memory module straight down into the memory slot until the retaining clips close and the new memory module snaps into position.

   Note: If there is a gap between the memory module and the retaining clips, the memory module has not been correctly installed. Open the retaining clips, remove the memory module, and then reinstall it into the slot.

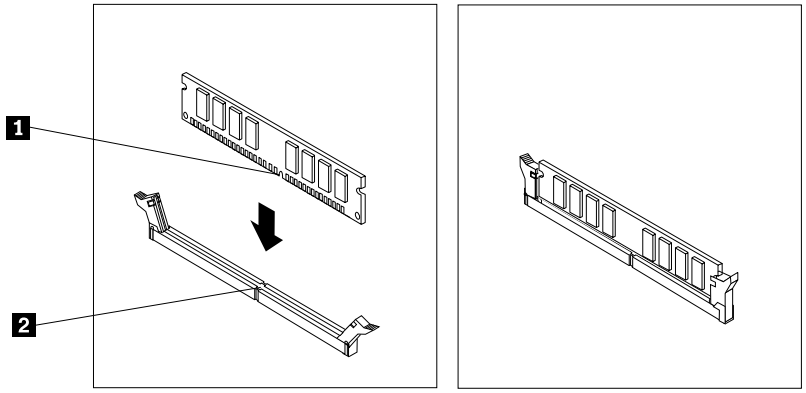


Figure 10. Installing the memory module

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 65.

Removing a memory module

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to remove a memory module.

To remove a memory module, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 19.
3. Locate the memory slot with the memory module that you want to remove. See "Locating parts on the system board" on page 14 for the locations of the memory slots.
4. Carefully open the retaining clips on each end of the memory slot and then grasp the memory module straight up by its edges.

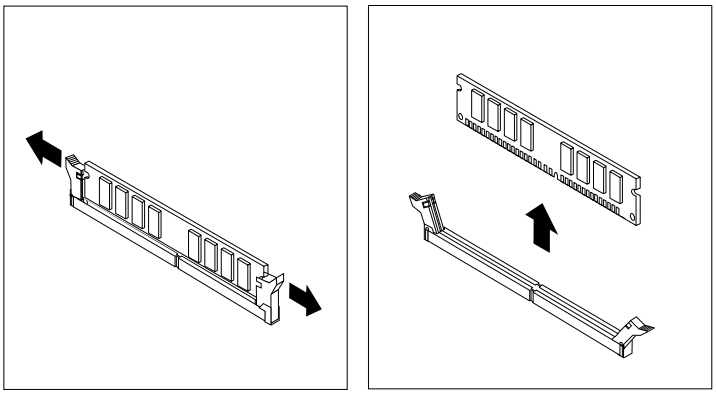


Figure 11. Removing the memory module

5. If you are instructed to return the failing memory module, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to "Completing the parts replacement" on page 65.

Removing or installing internal drives

This section provides instructions on how to remove or install internal drives for the server.

See "Specifications" on page 5 for information about the types of internal drives that the server supports and other important information, and see "Front view" on page 9 for the locations of the drive bays in the server.

When installing an internal drive, be sure to consider the following information:

- Make sure that you have all the cables and other equipment that is specified in the documentation that comes with the drive.
- Select the drive bay in which you want to install the drive.
- Check the instructions that come with the drive to see whether you have to set any switches or jumpers on the drive. If you are installing a SAS device, be sure to set the SAS ID for that device.

- The EMI integrity and cooling of the server are protected by having all bays, PCI slots, and PCI Express slots covered or occupied. When you install a drive, PCI card, or PCI Express card, save the EMC shield and filler panel from the bay, PCI card slot, or PCI Express card slot in the event that you later remove the device.
- For a list of the supported hard disk drives for your server, go to http://www.lenovo.com/thinkserver. On the ThinkServer systems page, click **Products → Options → ThinkServer Hard Drives**.

Removing the optical drive

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to remove the optical drive.

To remove the optical drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 19.
3. There is one screw on each side and two screws on the top. Remove the four screws that secure the drive access panel (1). Slide the drive access panel back and lift it to remove it (2).

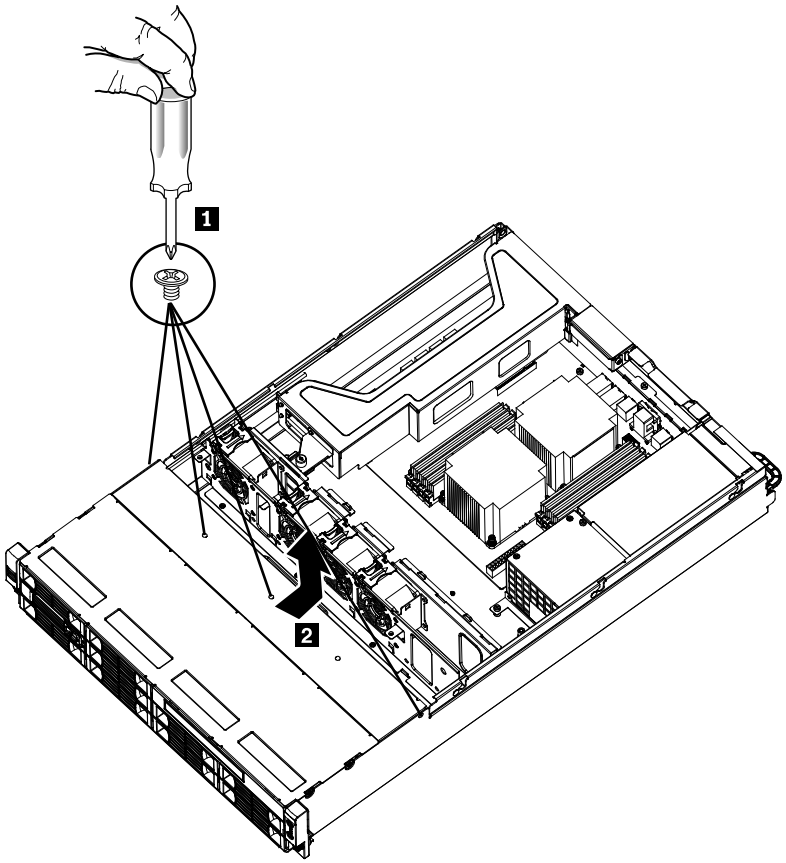


Figure 12. Removing the drive access panel

4. Disconnect the power cable and the signal cable from the rear of the optical drive.

5. Remove the retaining screw on the rear bracket of the optical drive.

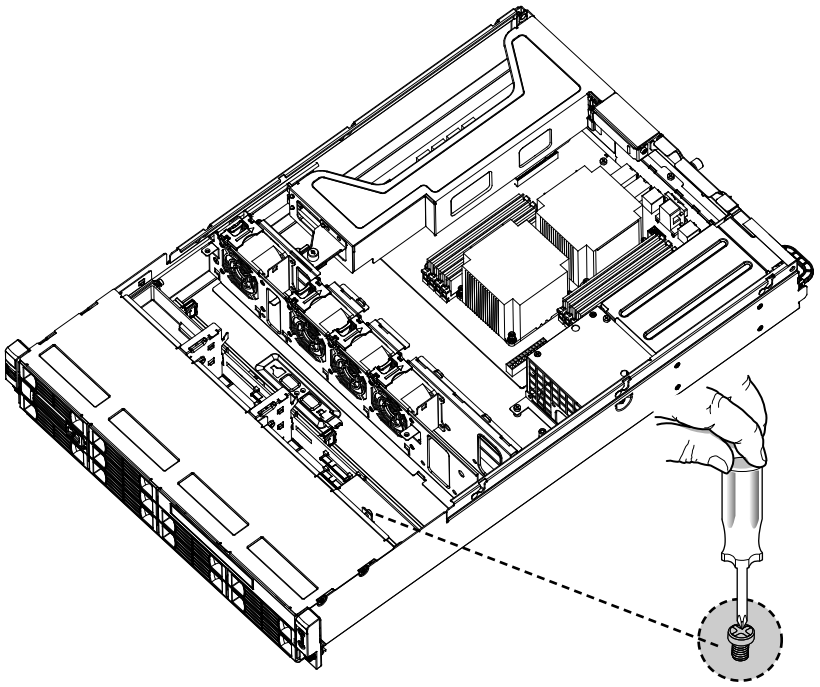


Figure 13. Removing the optical drive cage retaining screw

6. Slide out the optical drive cage with the optical drive.

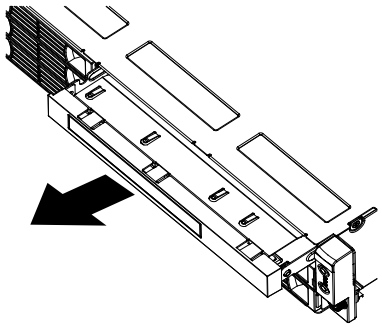


Figure 14. Sliding out the optical drive cage with the optical drive

7. Remove the two retaining screws that secure the optical drive in the cage. Then, slide the optical drive out of the cage.

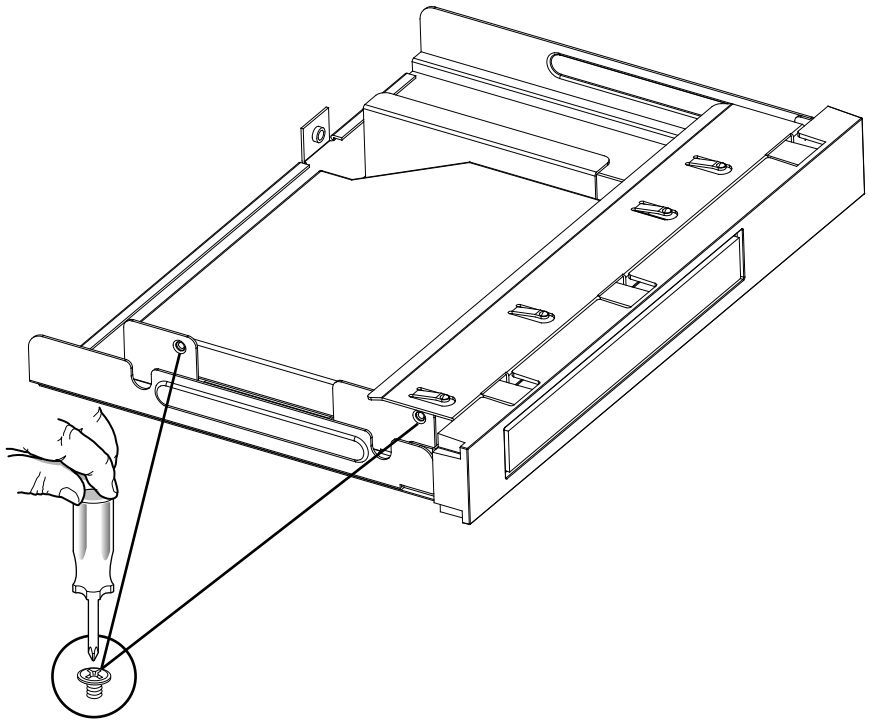


Figure 15. Removing the two retaining screws that secure the optical drive in the cage

8. If you are instructed to return the removed optical drive, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to "Completing the parts replacement" on page 65.

Installing the optical drive

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to install the optical drive.

To install the optical drive, do the following:

1. If you are replacing the optical drive, make sure that:
   - You have all the cables and other equipment that is specified in the documentation that comes with the new optical drive.
   - You have checked the instructions that come with the new optical drive to determine whether you must set any switches or jumpers in the drive.

   Note: If you are installing a drive that contains a laser, observe the following safety precautions.

Statement 3

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

2. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
3. Remove the server cover. See Removing the server cover.

4. There is one screw on each side and two screws on the top. Remove the four screws that secure the drive access panel (1). Slide the drive access panel back and lift it to remove it (2).

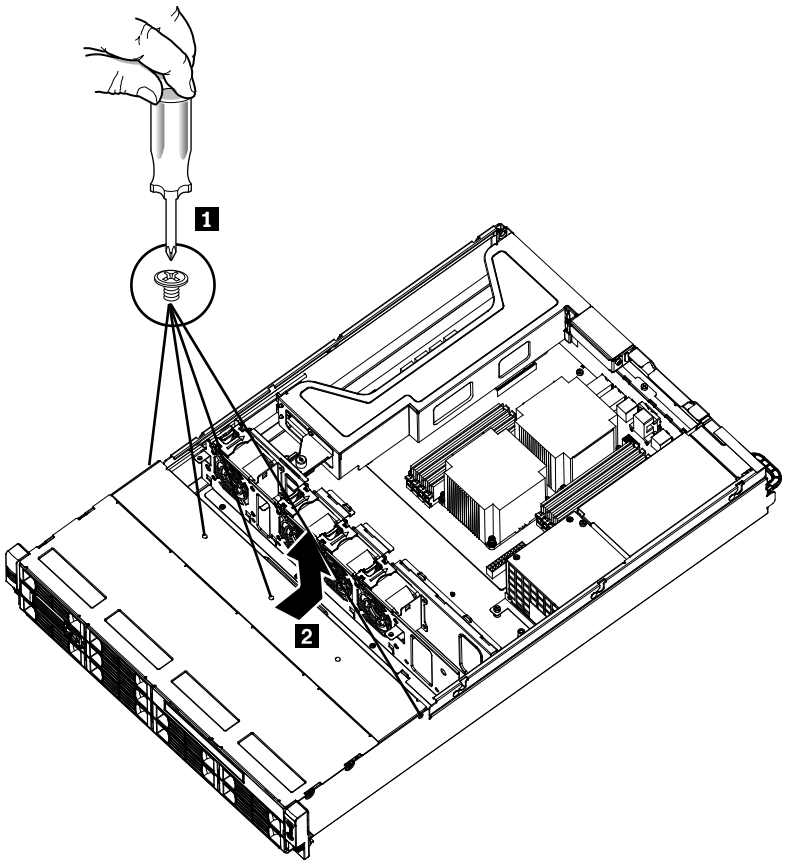


Figure 16. Removing the drive access panel

5. Remove the retaining screw on the rear bracket of the optical drive.

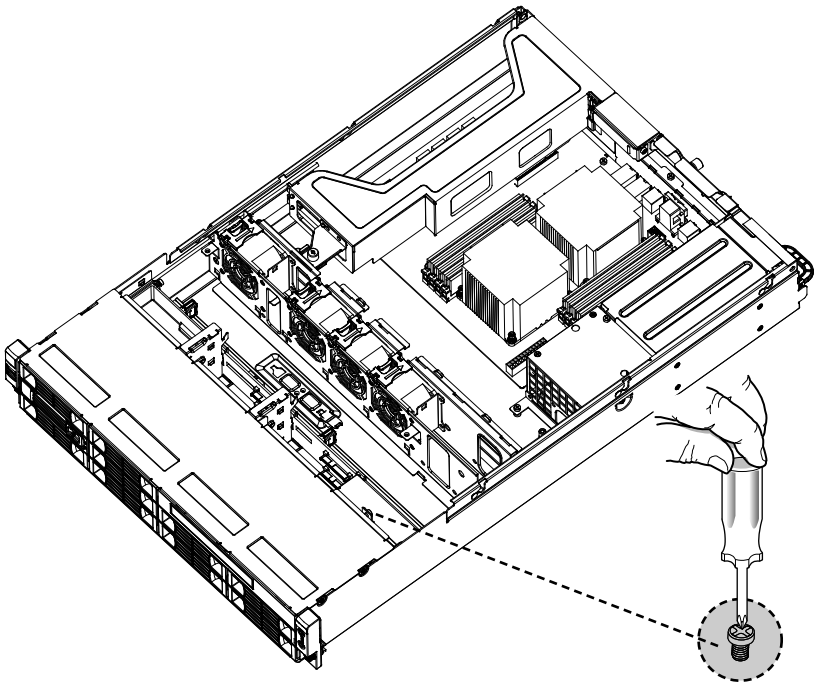


Figure 17. Removing the optical drive cage retaining screw

6. Slide out the optical drive cage.

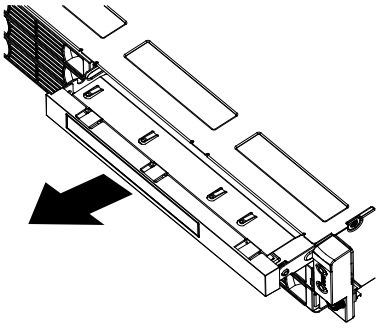


Figure 18. Sliding out the optical drive cage

7. Remove the bezel of the optical drive cage.

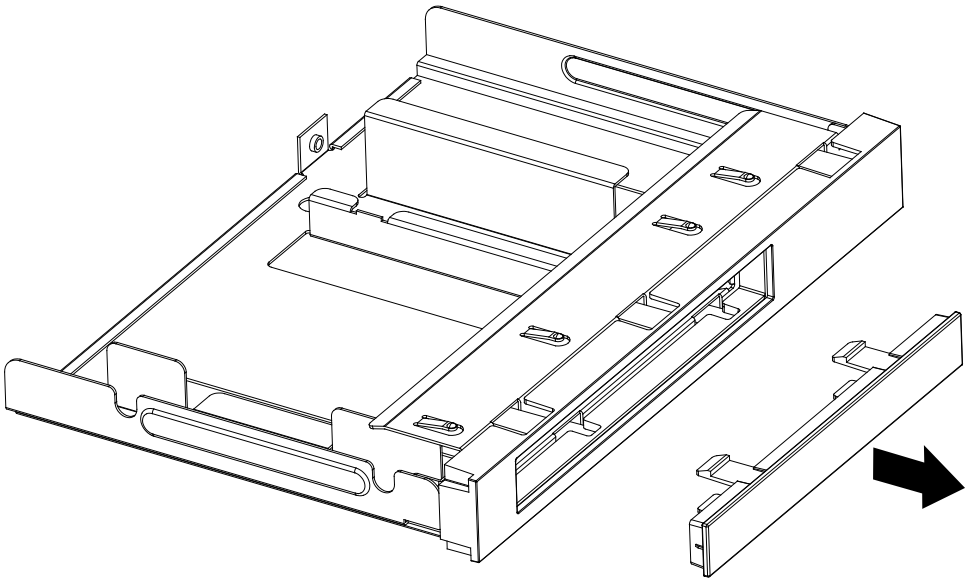


Figure 19. Removing the bezel of the optical drive cage

8. Touch the static-protective package that contains the new optical drive to any unpainted metal surface on the server. Then, remove the optical drive from the package and place it on a static-protective surface.
9. Follow the instructions that come with the optical drive to set jumpers or switches, if there are any.
10. Pay attention to the up and down position of the optical drive and slide the optical drive into place.

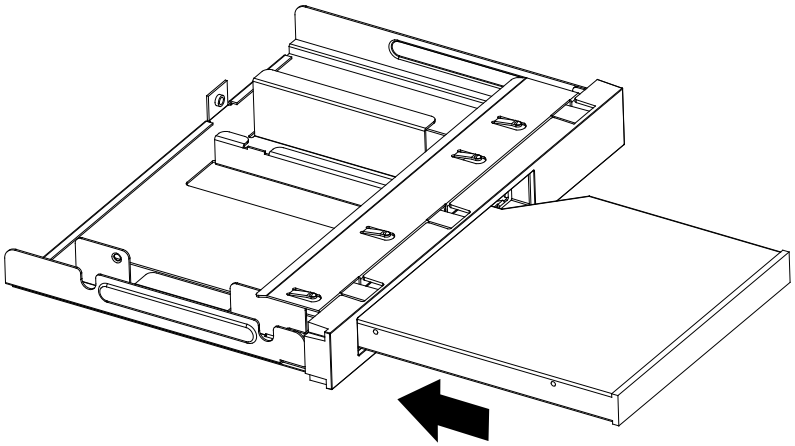


Figure 20. Sliding the optical drive into the drive cage

11. Install the two retaining screws to secure the optical drive in the cage.

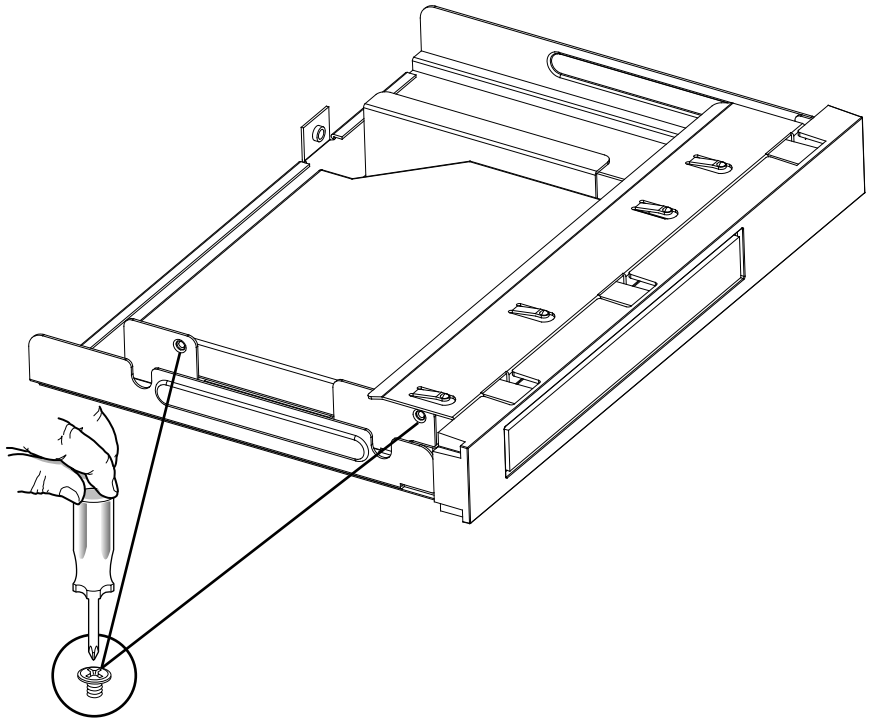


Figure 21. Securing the optical drive with screws

12. Slide the cage with the optical drive into place.

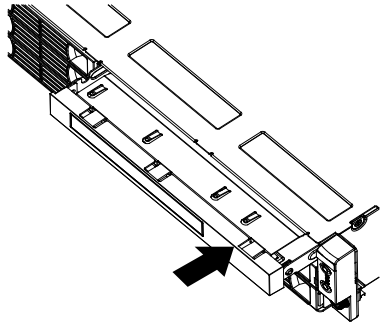


Figure 22. Sliding the cage with the optical drive into place

13. Install the retaining screw to the rear of the cage to secure the optical drive cage in place.

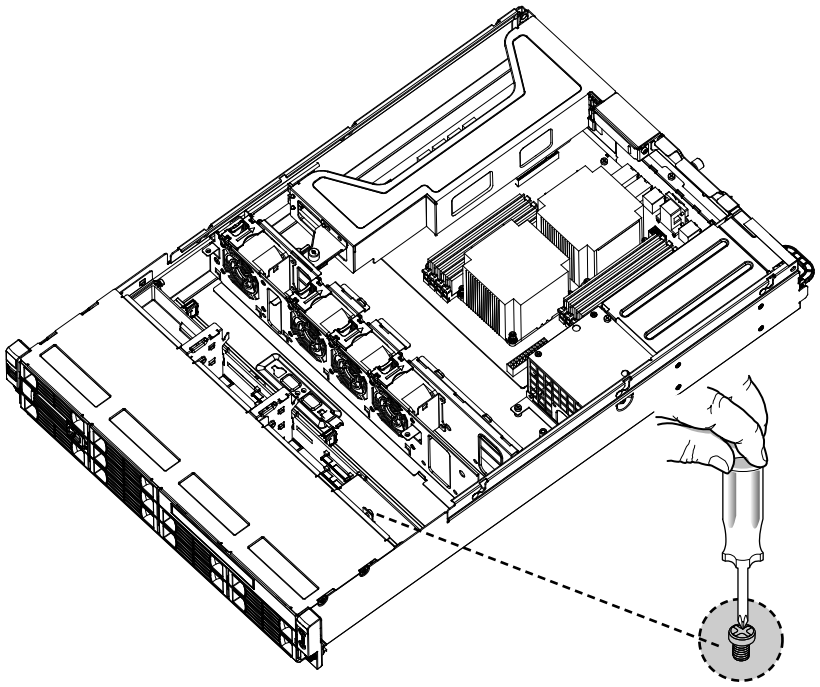


Figure 23. Installing the optical drive cage retaining screw

14. Connect the power cable (P8) and the signal cable (SATA cable) to the rear of the optical drive.
15. Reinstall the drive access panel and secure it in place by the four screws (one on each side and two on the top of the optical drive) that you have removed in step 4.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to "Completing the parts replacement" on page 65.

Removing a hot-swap hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to remove a hot-swap hard disk drive. This section applies only to server models that have hot-swap hard disk drives installed.

Attention: To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed in each drive bay.

To remove a hot-swap hard disk drive, do the following:

Note: You do not have to turn off the server when removing a hot-swap hard disk drive.

1. Press the blue latch to open the hard disk drive tray (1) and rotate the handle of the hard disk drive tray assembly to the open position (2). Then, grasp the handle and pull the hard disk drive tray assembly out of the bay (3).

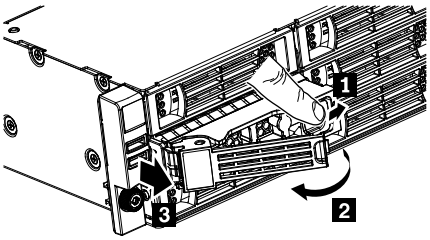


Figure 24. Removing the hard disk drive tray assembly

2. Remove the four retaining screws that secure the hard disk drive in the tray. Then, remove the hard disk drive.
3. If you are instructed to return the removed hard disk drive, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to "Completing the parts replacement" on page 65.

Installing a hot-swap hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to install a hot-swap hard disk drive. This section applies only to server models that support hot-swap hard disk drives.

Attention: To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed in each drive bay.

To install a hot-swap hard disk drive, do the following:

Note: You do not have to turn off the server for the installation of a hot-swap hard disk drive.

1. If you are replacing a hot-swap hard disk drive, remove the old one first. See "Removing a hot-swap hard disk drive" on page 32. If you are installing a hot-swap hard disk drive in a blank bay, remove the filler panel for the bay.
2. Touch the static-protective package that contains the hard disk drive to any unpainted metal surface on the server. Then, remove the hard disk drive from the package.

   Note: The hot-swap hard disk drive server option for RD240 server is a fully assembled tray with the hard disk drive installed in the tray.

3. Keep the handle on the hard disk drive tray assembly fully open, slide the tray with the hard disk drive into the corresponding mounting point of the hot-swap hard disk drive bay (1), and then slightly press the handle to lock the tray into place (2).

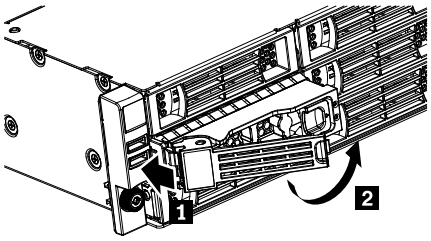


Figure 25. Installing the hard disk drive tray assembly

4. Check the hard disk drive status LEDs to make sure that the hard disk drive is operating correctly. You might have to restart the server for the drive to be recognized. If the amber hard disk drive status LED for a drive is lit continuously, it indicates that the drive is faulty and must be replaced; if the green hard disk drive activity LED is flashing, this indicates that the drive is being accessed.

   Note: If the server is configured for RAID operation using a RAID controller, you might have to reconfigure the disk arrays after you replace hard disk drives.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to "Completing the parts replacement" on page 65.

Removing or installing the riser card assembly

This section provides instructions on how to remove or install the riser card assembly.

Removing the riser card assembly

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to remove the riser card assembly with PCI card(s) installed.

To remove the riser card assembly, do the following:

Note: Use any documentation that comes with the riser card and follow those instructions in addition to the instructions in this section.

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See Removing the server cover.
3. Disconnect any cables from the PCI card or any cables that impede access to the riser card.

4. Loosen the retaining screws on the front and rear of the riser card assembly. Then, remove the riser card assembly from the server.

   Note: If the riser card is secured in place by a retaining latch 1, press the retaining latch to release the riser card from the latch. Then, carefully pull the riser card assembly out of the slot. If necessary, alternate moving each side of the riser card a small and equal amount until it is completely removed from the slot.

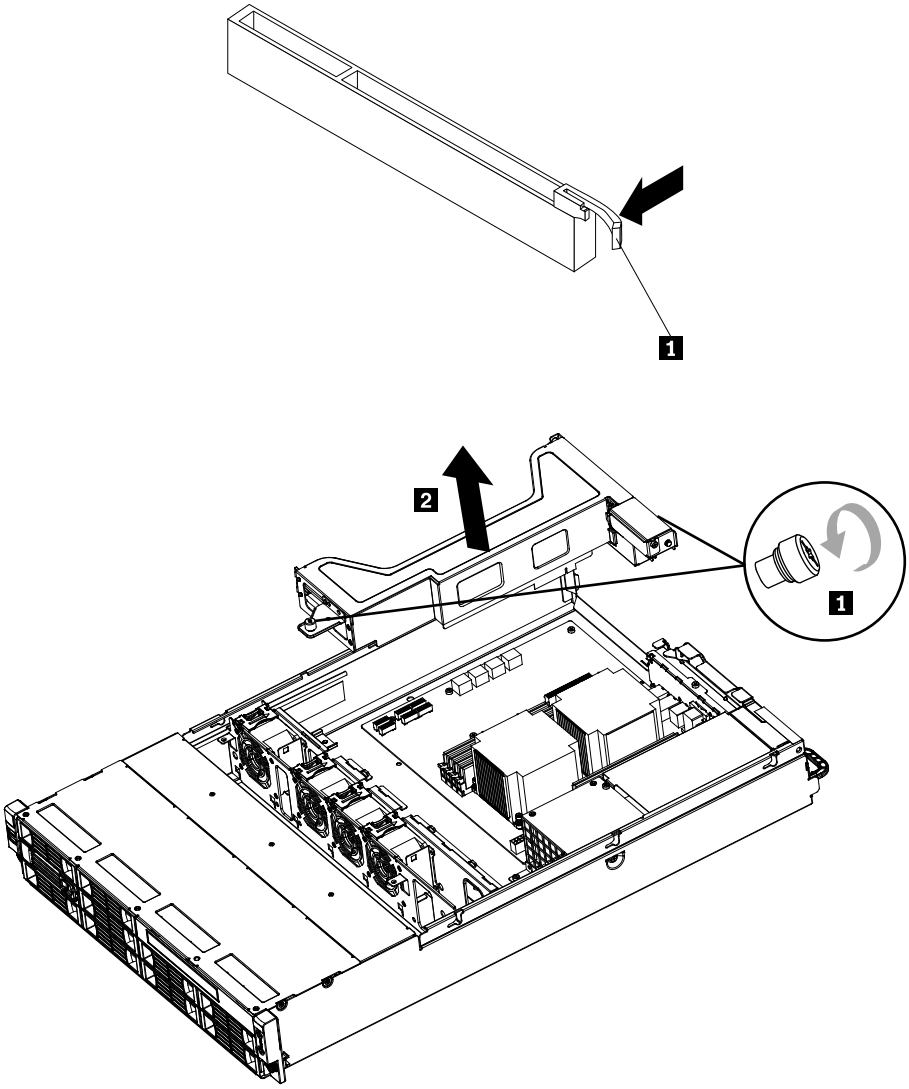


Figure 26. Removing the riser card assembly

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to "Completing the parts replacement" on page 65.

Installing the riser card assembly

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to install the riser card assembly. The riser card assembly might have PCI card(s) installed on it.

To install the riser card assembly, do the following:

Note: Use any documentation that comes with the riser card and follow those instructions in addition to the instructions in this section.

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See Removing the server cover.
3. Touch the static-protective package that contains the riser card to any unpainted metal surface on the server. Then, remove the riser card from the static-protective package.
4. Position the riser card assembly in place so that you can press the riser card straight down into the PCI card slot on the system board. See Locating parts on the system board. Then, install the two screws to secure the riser card assembly in place. You might need a screw driver to make sure that the screws are firmly tightened and the riser card assembly is securely installed. Do not over-tighten the screws.

   Note: You might need to press the retaining latch of the slot to secure the riser card into the slot.

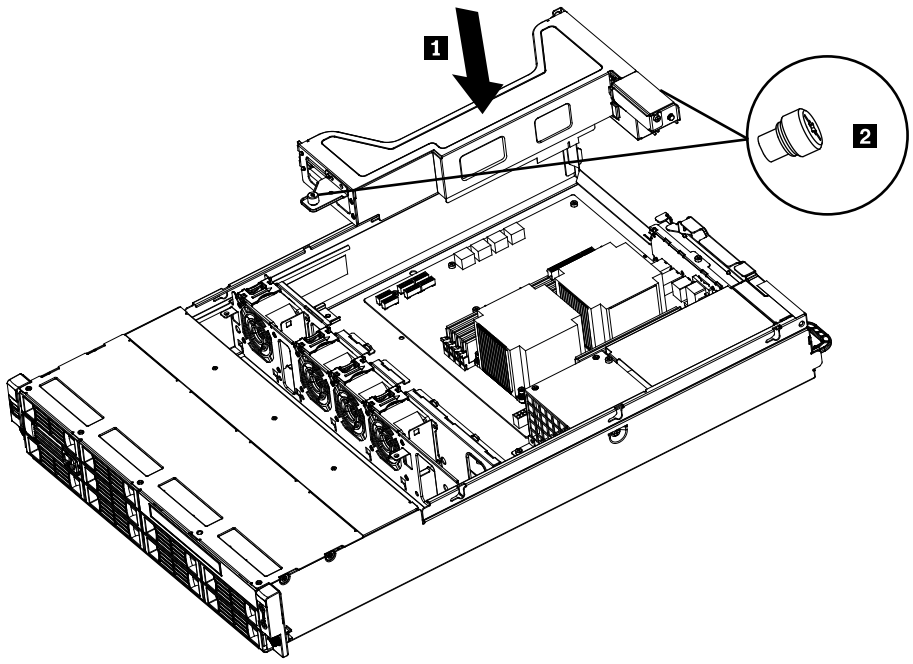


Figure 27. Installing the riser card assembly

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 65.

Installing or removing a PCI card

This section provides instructions on how to install or remove a PCI card.

Installing a PCI card

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to install a PCI card.

To install a PCI card, do the following:

Note: Use any documentation that comes with the PCI card and follow those instructions in addition to the instructions in this section.

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 19.
3. Remove the riser card assembly. See "Removing the riser card assembly" on page 34.
4. Locate an appropriate PCI card slot on the riser card assembly. Then, remove the screw on the side that secures the metal slot cover.
5. Install the PCI card into the slot on the riser card assembly (1). Then, install the screw to secure the PCI card in place (2).

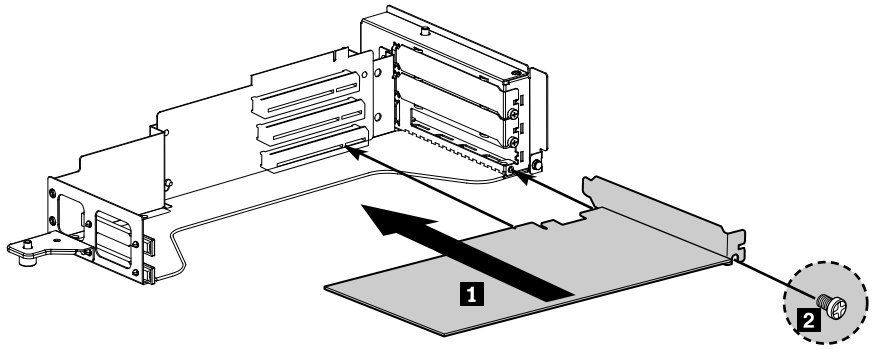


Figure 28. Installing a PCI card into the slot on the riser card assembly

6. Reinstall the riser card assembly into the card slot on the system board. See Installing the riser card assembly.
7. Connect any cables to the PCI card.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to "Completing the parts replacement" on page 65.

Removing a PCI card

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to remove a PCI card.

The PCI card is installed on the riser card assembly. To remove a PCI card, do the following:

Note: Use any documentation that comes with the PCI card and follow those instructions in addition to the instructions in this section.

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See Removing the server cover.
3. Disconnect any cables from the PCI card or any cables that impede access to the riser card assembly.
4. Remove the riser card assembly together with the installed PCI card. See “Removing the riser card assembly” on page 34.
5. Remove the screw that secures the PCI card and then grasp the PCI card by its edges and remove it from the slot on the riser card assembly.

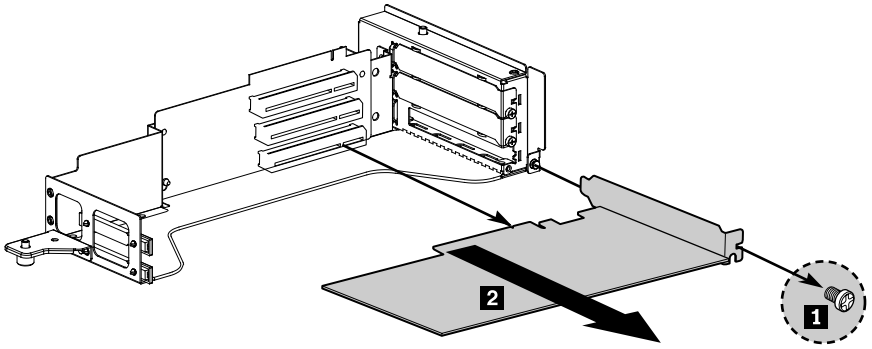


Figure 29. Removing the PCI card from the riser card assembly

6. If you are instructed to return the PCI card, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 65.

Installing, removing, or replacing hardware devices

This section provides instructions on how to install, remove, or replace hardware devices for your server. You can maintain your server by replacing the failing hardware devices. If you are replacing a hardware device, perform the removal procedure and then perform the installation procedure for the hardware device that you want to replace.

Removing or installing the system board battery

This section provides instructions on how to remove or install the system board battery.

Removing the system board battery

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 17.

This section provides instructions on how to remove the system board battery.

To remove the system board battery, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 19.
3. Locate the battery on the system board. See “Locating parts on the system board” on page 14.
4. Remove the system board battery.

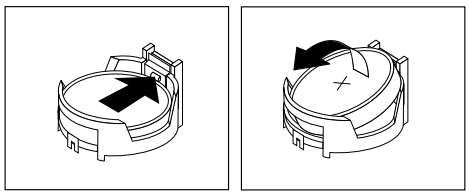


Figure 30. Removing the system board battery

5. Dispose of the battery as required by local ordinances or regulations.

What to do next:

- To install a new system board battery, see “Installing the system board battery” on page 39.
- To work with another piece of hardware, go to the appropriate section.

Installing the system board battery

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 17.

This section provides instructions on how to install the system board battery.

Be sure to consider the following information when you replace the battery in the server:

- You must replace the battery with a lithium battery of the same type from the same manufacturer.
- After you replace the system board battery, you must reconfigure the server and reset the system date and time.
- To avoid possible danger, read and follow the following safety statement.

Statement 2

CAUTION:
When replacing the lithium battery, use only the battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

To install the system board battery, do the following:

Note: Follow any special handling and installation instructions that come with the replacement battery.

1. Hold the system board battery **1** and position one side of the battery into its socket. Then, press the other side of the battery until it snaps into place.

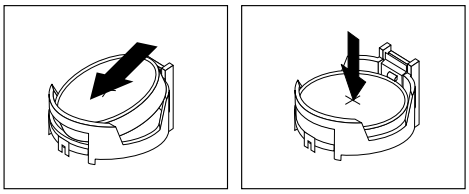


Figure 31. Installing the system board battery

2. Make sure that the battery clip holds the battery securely.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to "Completing the parts replacement" on page 65. You need to use the Setup Utility program and reset the configuration, such as the system date and time and passwords. See "Starting the Setup Utility program" on page 70 for details.

Removing or installing the RAID controller

This section provides instructions on how to remove or install the RAID controller.

Removing the RAID controller

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to remove the RAID controller if your server has one installed.

Notes:

1. Use any documentation that comes with the RAID controller and follow those instructions in addition to the instructions in this section.
2. When you disconnect the power source from the server, you lose the ability to view the LEDs because the LEDs are not lit when the power source is removed. Before you disconnect the power source, make a note of which LEDs are lit, including the LEDs that are lit on the front control panel.

The RAID controller is installed on the riser card assembly. To remove the RAID controller, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 19.
3. Press the tabs on both sides of the connector on the signal cables towards each other and remove the cables from the RAID controller.
4. Disconnect any other cables from the RAID controller or any cables that impede access to the riser card assembly.
5. Remove the riser card assembly together with the installed RAID controller. See "Removing the riser card assembly" on page 34.

6. Refer to “Removing a PCI card” on page 37 and follow those instructions to remove the RAID controller from the riser card assembly.

   Note: Depending on your RAID controller, if necessary, remove the RAID battery from the RAID controller by removing the screws that secure the battery on the controller and disconnecting any cables.

7. If you are instructed to return the RAID controller, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 65.

Installing the ThinkServer 8708ELP SAS RAID Adapter

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 17.

This section provides instructions on how to install the ThinkServer 8708ELP SAS RAID Adapter (hereafter referred to as the RAID controller within this section).

To install the RAID controller, do the following:

Note: Use any documentation that comes with the RAID controller and follow those instructions in addition to the instructions in this section.

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 19.
3. Touch the static-protective package that contains the RAID controller to any unpainted surface on the outside of the server. Then, remove the RAID controller from the package.
4. Depending on your RAID controller, you might need to install a ThinkServer 8708ELP SAS RAID adapter battery (hereafter referred to as the battery card assembly) on the RAID controller. The battery card assembly mounts directly to the RAID controller using a small board-to-board connector (daughtercard). To install the battery card assembly on the RAID controller, do the following:

   Notes:

   a. The battery card assembly protects the integrity of the cached data on the RAID controller by providing backup power up to 72 hours in the case of a complete ac power failure or a brief power outage. It has built-in functionality to charge the battery pack automatically and to communicate battery status information such as voltage, temperature, and current to your server. It also provides an inexpensive alternative to using an uninterruptible power supply, and a second level of fault tolerance when used in conjunction with an uninterruptible power supply. For more information about the battery card assembly, see Appendix A “RAID battery card assembly” on page 101.

   b. The battery card assembly option kit contains a user guide, the battery card assembly, and three Phillips-head screws. Do not remove the battery card assembly from the antistatic shipping container until you are ready to install it. When you remove the battery card assembly from your server, place it in its original container.

   c. Check the appropriate support Web sites for the latest updates for your basic input/output system (BIOS) code, utility programs, device drivers, and other software applications. Follow the instructions provided by your Service Provider to download and install updates.

   d. It is recommended that you replace the battery pack on the battery card assembly annually or after 500 recharging cycles, whichever comes first.

e. The temperature of the battery card assembly is generally 15–20 degrees higher than the ambient temperature during fast charge. Therefore, to complete fast charge cycle, the ambient temperature should be less than 45 degrees. If the ambient temperature exceeds 45 degrees, the fast charge cycle will terminate prematurely, thus preventing the battery card assembly from reaching a fully charged state.

Attention:

- When attaching the battery card assembly to a PCI Express slot, center the Phillips-head screw driver to avoid damaging the screw head and do not over-tighten the screws as you might damage the battery card assembly.
- The battery in the battery card assembly must recharge for at least six hours during fast charge under normal operating conditions.

a. Note the top view and the bottom view of the battery card assembly. Then, insert the battery pack harness connector into the 5-pin J3 battery pack harness connector on the backside of the battery card assembly.

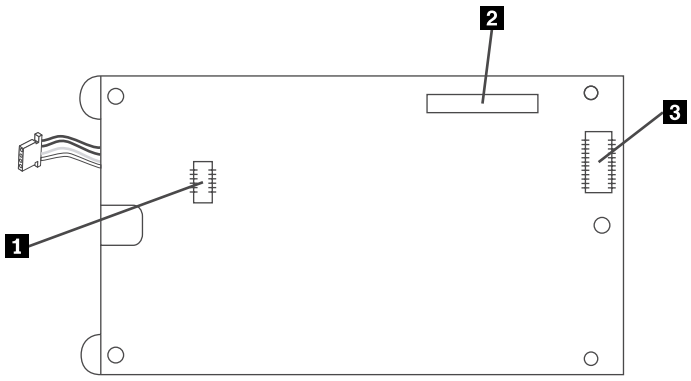


Figure 32. Bottom view of the battery card assembly

1 J3 battery pack harness connector

2 J1 connector

3 J2 board-to-board connector

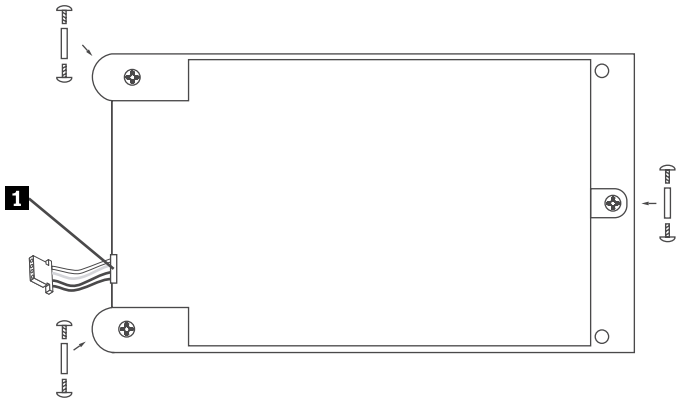


Figure 33. Top view of the battery card assembly

1 Battery pack harness

b. With the front side up, place the RAID controller on a flat, clean, static-free surface.

c. Hold the battery card assembly with the battery side up and the J2 board-to-board connector lining up with the J7 BBU connector 1 on the RAID controller. Carefully press the battery card assembly onto the RAID controller so that the two connectors are firmly joined. Then, secure the battery card assembly to the RAID controller with the three screws and the standoffs that come with the battery card assembly accessory kit.

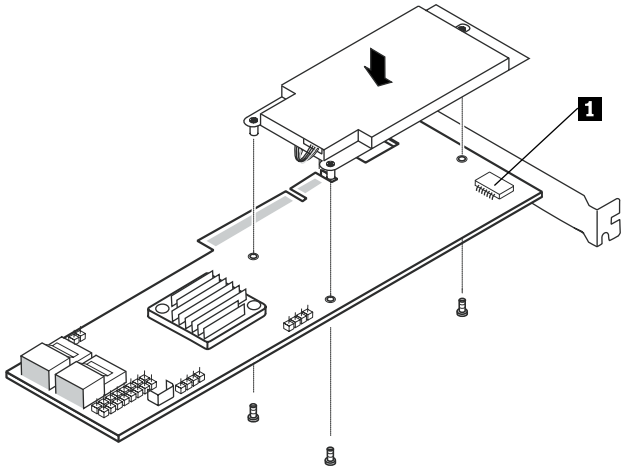


Figure 34. Installing the battery card assembly

5. See “Installing a PCI card” on page 37 and follow those instructions to install the RAID controller.
6. Connect the mini SAS signal cables to the RAID controller and the backplane by doing the following:

   Note: Use the two 440 mm (17.32 inches) mini SAS signal cables.

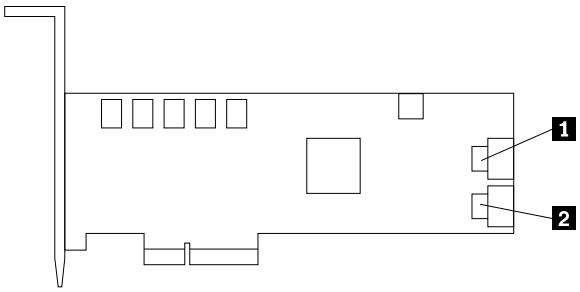


Figure 35. Connecting the mini SAS signal cable

1 Port 0-3

2 Port 4-7

a. For one mini SAS signal cable, connect one end to the port 0-3 on the RAID controller. Then, connect the other end to the mini SAS signal connector 1 on the backplane. See Locating connectors on the backplane.

b. For the other SAS signal cable, connect one end to the port 4-7 on the RAID controller. Then, connect the other end to the mini SAS signal connector 2 on the backplane. See Locating connectors on the backplane.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 65.

Installing the ThinkServer 8708EM2 RAID Adapter

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 17.

This topic provides instructions on how to install the ThinkServer 8708EM2 RAID Adapter (hereafter referred to as the RAID controller within this topic) and the battery card assembly for this RAID controller.

Product description

The RAID controller enables you to create the tiered storage with SATA hard disk drives, SAS hard disk drives, or both. With the MD2 low-profile form factor and two internal mini SAS connectors, it enables you to attach up to 32 hard disk drives to high-density servers and systems for maximum design flexibility. It also supports all key RAID levels, including RAID 6 and RAID 60, to provide increasing fault tolerance.

Note: RAID 50 and RAID 60 are only available for more than six hard disk drives.

Your option package includes:

- ThinkServer 8708EM2 RAID Adapter
- One 400 mm (15.7 inches) mini SAS signal cable (for your server model, this cable will not be used)
- Two 630 mm (24.8 inches) mini SAS signal cables
- The user guide for the option

Note: To use the RAID controller, you need to install the ThinkServer 8708EM2 RAID Battery (product number: 67Y2629) on the RAID controller. The ThinkServer 8708EM2 RAID Battery does not come with the RAID controller. You need to separately order it.

Overview of the 8708EM2 RAID controller

The following illustration shows the overview of the RAID controller.

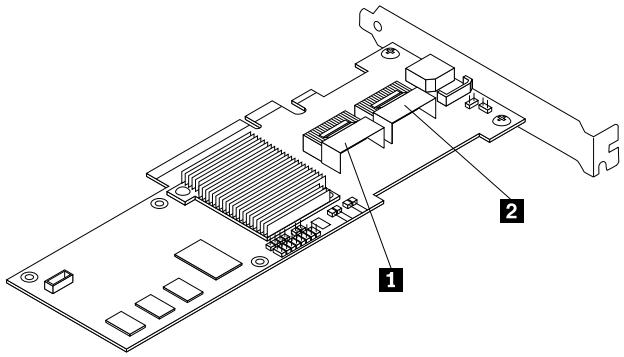


Figure 36. Overview of the 8708EM2 RAID controller

1 Port 0-3

2 Port 4-7

Installing the RAID controller

Attention: If you install the RAID controller on an onboard SATA and hot-swap based server, you need to reconfigure the RAID controller and reinstall the operating system. Make sure you back up your data before reconfiguration and reinstallation. Use the *ThinkServer EasyStartup* DVD that came with your server to reconfigure the RAID controller, reinstall device drivers, and reinstall the operating system.

To install the RAID controller, do the following:

Note: Use any documentation that comes with the RAID controller and follow those instructions in addition to the instructions in this topic.

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 19.
3. Remove the riser card assembly. See “Removing the riser card assembly” on page 34.
4. Touch the static-protective package that contains the RAID controller to any unpainted surface on the outside of the server. Then, remove the RAID controller from the package.
5. Install the ThinkServer 8708EM2 RAID Battery (hereafter called the battery card assembly) on the RAID controller. Use any documentation that comes with the battery card assembly and follow those instructions in addition to the instructions in “Installing the ThinkServer 8708EM2 RAID Battery” on page 47.

   Note: The ThinkServer 8708EM2 RAID Battery does not come with the RAID controller. You need to separately order it.
6. Use the two 630 mm (24.8 inches) mini SAS signal cables. Connect one end of one mini SAS signal cable to port 0-3 on the RAID controller and one end of the other mini SAS signal cable to port 4-7 on the RAID controller. See “Overview of the 8708EM2 RAID controller” on page 45.
7. Locate an appropriate PCI card slot on the riser card assembly. Then, remove the screw on the side that secures the metal slot cover.
8. Install the RAID controller into an appropriate PCI card slot on the riser card assembly. Then, install the screw to secure the RAID controller in place.

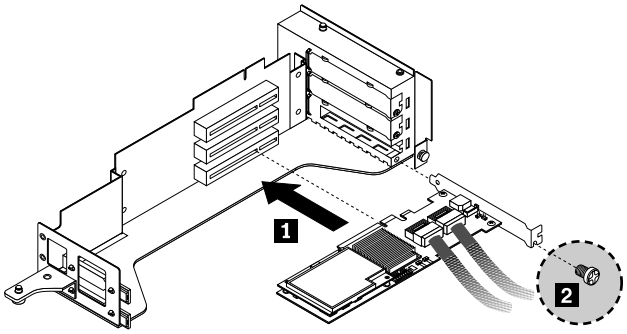


Figure 37. Installing the RAID controller into a PCI card slot on the riser card assembly

9. For the mini SAS signal cable attached to port 0-3 on the RAID controller, connect the other end to the mini SAS signal cable connector 1 (2) on the backplane of your server. For the mini SAS signal cable attached to port 4-7 on the RAID controller, connect the other end to the mini SAS signal cable connector 2 (1) on the backplane of your server.

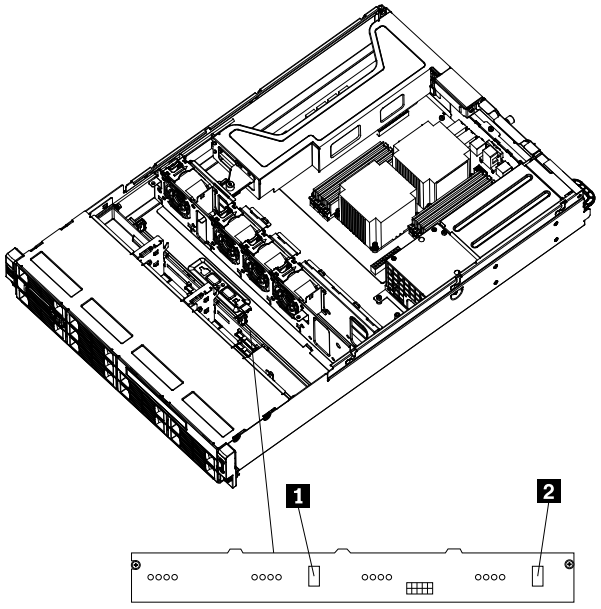


Figure 38. Backplane connector locations

1 Mini SAS signal connector 2

2 Mini SAS signal connector 1

Installing the ThinkServer 8708EM2 RAID Battery

This topic provides instructions on how to install the ThinkServer 8708EM2 RAID Battery (hereafter called the battery card assembly).

Product description

The ThinkServer 8708EM2 SAS RAID Controller Battery protects the integrity of the cached data on the 8708EM2 SAS RAID controller by providing backup power up to 72 hours in case of a complete ac power failure or a brief power outage. It has a built-in functionality to charge the battery pack automatically and to communicate battery status information such as voltage, temperature, and current to your server. It also provides an inexpensive alternative by using an uninterruptible power supply, and a second level of fault tolerance when used in conjunction with an uninterruptible power supply.

CAUTION:
It is recommended that you replace the battery pack on the battery card assembly once a year or after 500 recharging cycles, whichever comes first.

Your option package contains the following:

- The ThinkServer 8708EM2 SAS RAID Controller Battery
- Three Phillips-head screws
- The user guide for the option

Top view

The figure below shows the top view of the battery card assembly.

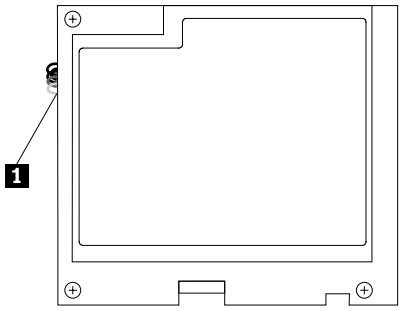


Figure 39. Top view of the battery card assembly

1 battery pack harness

Bottom view

The figure below shows the bottom view of the battery card assembly.

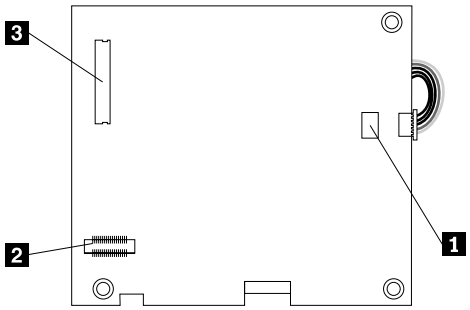


Figure 40. Bottom view of the battery card assembly

1 J4 battery pack harness connector

2 J5 board-to-board connector

3 J2 connector

Installing the battery card assembly

Before you install the battery card assembly, take the following precautions to prevent static electricity from damaging electronic parts:

- Before touching any electronic parts, drain the static electricity from your body. You can do this by touching the metal frame of your server.
- Do not remove the battery card assembly from the antistatic shipping container until you are ready to install it. When you remove the battery card assembly from your server, place it in its original container.

Note: Check the appropriate support Web sites for the latest updates for your basic input/output system (BIOS) code, utility programs, device drivers, and other software applications. Follow the instructions provided by your Service Provider to download and install updates.

Online technical support is available through the Lenovo Support Web site at:
http://www.lenovo.com/support

Attention:

- Electrostatic discharge can damage the battery card assembly and the 8708EM2 RAID adapter on which the battery card assembly is installed. Always ground yourself and use a ground strap before touching the battery card assembly or the 8708EM2 RAID adapter. Perform the installation procedure at an ESD-safe workstation.
- When attaching the battery card assembly to a PCI Express slot, center the Phillips-head screw driver to avoid damaging the screw head and do not over-tighten the screws as you might damage the battery card assembly.
- The battery in the battery card assembly must recharge for at least six hours during fast charge under normal operating conditions.
- The temperature of the battery card assembly is generally 15-20 degrees higher than the ambient temperature during fast charge. Therefore, to complete a fast charge cycle, the ambient temperature should be less than 45 degrees. If the ambient temperature exceeds 45 degrees, the fast charge cycle will terminate prematurely, thus preventing the battery card assembly from reaching a fully charged state.

The battery card assembly mounts directly to the 8708EM2 SAS RAID controller using a small board-to-board connector. To install the battery card assembly for the 8708EM2 SAS RAID controller, do the following:

1. Remove the battery card assembly from the package.
2. Insert the battery pack harness (as shown in “Top view” on page 48) into the 5-pin J4 battery pack harness connector (as shown in “Bottom view” on page 48) on the back side of the battery card assembly.
3. With the 8708EM2 SAS RAID controller on a flat, clean, and static-free surface, hold the battery card assembly with the battery side up and the J5 board-to-board connector (as shown in “Bottom view” on page 48) lining up with the J10 BBU (battery backup units) connector on the 8708EM2 SAS RAID controller, as shown:

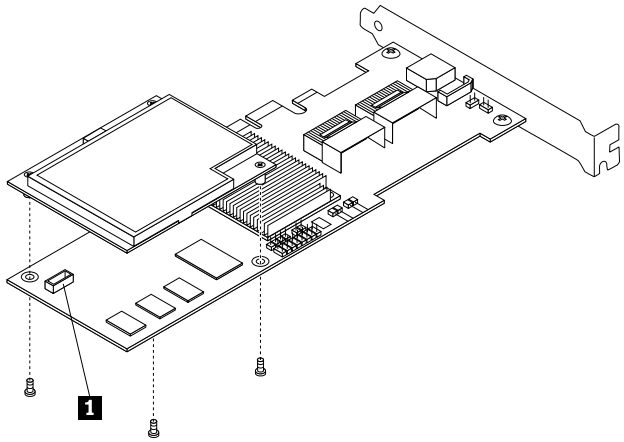


Figure 41. Installing the battery card assembly onto the 8708EM2 SAS RAID controller

1 J10 BBU connector

4. Carefully press the battery card assembly onto the 8708EM2 SAS RAID controller, so that the two connectors are firmly joined.
5. Use the provided Phillips-head screws to secure the battery card assembly to the 8708EM2 SAS RAID controller.
6. Install the 8708EM2 SAS RAID controller with the battery card assembly into a selected PCI Express slot in your server. See “Installing the ThinkServer 8708EM2 RAID Adapter” on page 45.

Removing or installing the Ethernet card

This section provides instructions on how to remove or install the Ethernet card.

Removing the Ethernet card

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to remove the Ethernet card.

The Ethernet card is installed on the riser card assembly. To remove the Ethernet card, do the following:

Note: Use any documentation that comes with the Ethernet card and follow those instructions in addition to the instructions in this section.

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 19.
3. Disconnect any cables that impede access to the riser card assembly.
4. Remove the riser card assembly together with the installed Ethernet card. See "Removing the riser card assembly" on page 34.
5. Refer to "Removing a PCI card" on page 37 and follow those instructions to remove the Ethernet card from the riser card assembly.
6. If you are instructed to return the Ethernet card, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to "Completing the parts replacement" on page 65.

Installing the Ethernet card

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to install the Ethernet card and how to install the Ethernet card driver on Windows operating systems.

To install the Ethernet card, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 19.
3. Touch the static-protective package that contains the Ethernet card to any unpainted surface on the outside of the server. Then, remove the Ethernet card from the package.
4. See "Installing a PCI card" on page 37 and follow those instructions to install the Ethernet card. Install the Ethernet card into the appropriate PCI card slot (slot 2 or slot 3) on the riser card assembly (the bottom or the middle slot when the riser card is installed on the system board).

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to "Completing the parts replacement" on page 65.

On Linux operating systems, you do not need to install any device driver for the Ethernet card; on Windows operating systems, you need to install the device driver for the Ethernet card. To install the device driver on Windows operating systems, do the following:

1. Save any open documents and exit all applications.
2. Insert the *ThinkServer EasyStartup* DVD that came with your server into the DVD drive.

   Note: You do not need to use the driver disc that came with the Ethernet card.
3. Right-click My Computer and select **Properties**. The System Properties window opens.
4. On the **Hardware** tab, click the **Device Manager** button. The Device Manager window opens.
5. Expand the **Network adapters** and then right-click one of the Ethernet cards (PRO/1000PT or the yellow question mark).
6. Select **Update Driver...**. The Hardware Update Wizard program opens.
7. Select **Install the software automatically (Recommended)** and click **Next** to continue.
8. Follow the instructions on the screen.

Removing or installing the microprocessor fan duct

This section provides instructions on how to remove or install the microprocessor fan duct.

Removing the microprocessor fan duct

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 17.

This section provides instructions on how to remove the microprocessor fan duct.

To remove the microprocessor fan duct, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See Removing the server cover.

3. Slide the microprocessor fan duct a little bit backward to release the three plastic tabs from the chassis. Then, lift the microprocessor fan duct out of the chassis.

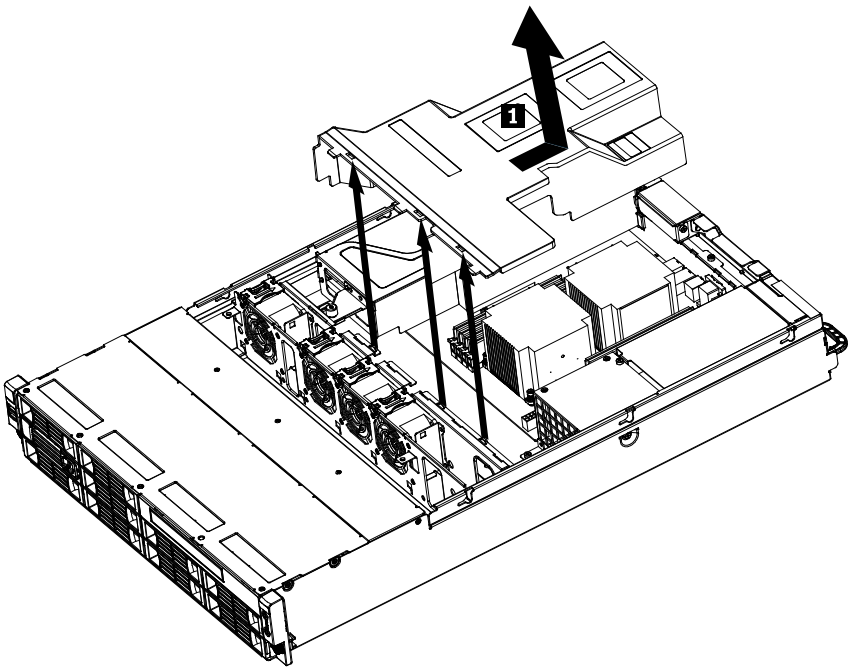


Figure 42. Removing the microprocessor fan duct

4. To install the microprocessor fan duct, see Installing the microprocessor fan duct.

Installing the microprocessor fan duct

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 17.

This section provides instructions on how to install the microprocessor fan duct.

To install the microprocessor fan duct, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See Removing the server cover.
3. Place the microprocessor fan duct over the heat sink(s) and insert the three plastic tabs on one side of the duct with the corresponding holes in the chassis. Then, carefully pivot the other side down to install the duct in place.
4. To complete the installation, go to Completing the parts replacement.

Removing or installing the power supply

This section provides instructions on how to remove or install the power supply.

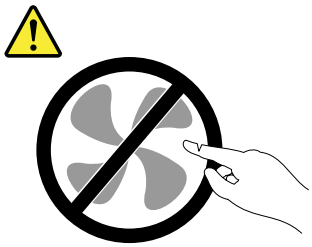
Removing the power supply

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 17.

This section provides instructions on how to remove the power supply.

When you remove a power supply, observe the following precautions.

CAUTION:
Hazardous moving parts are nearby.



Statement 8

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

To remove the power supply, do the following:

1. Press the tab **1** of the power supply and pull the handle **2** to slide the power supply out of the server.

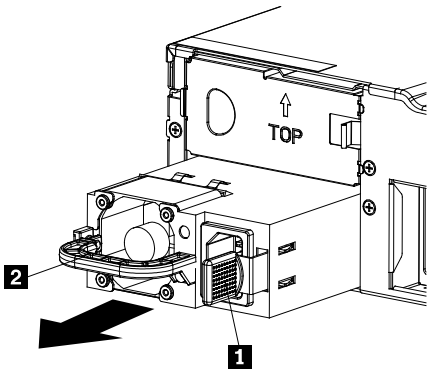


Figure 43. Removing the power supply

2. If you are instructed to return the power supply, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To install a new power supply, see “Installing the power supply” on page 54.
- To work with another piece of hardware, go to the appropriate section.

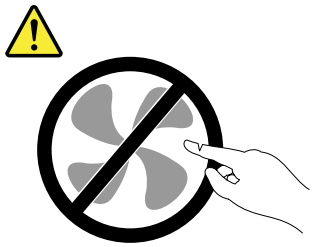
Installing the power supply

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 17.

This section provides instructions on how to install the power supply.

When you install a power supply, observe the following precautions.

CAUTION:
Hazardous moving parts are nearby.



Statement 8

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

To install a power supply, do the following:

1. Press the tab 1 on the bezel that covers the bay of the power supply and insert a finger into the hole 2 in the middle of the bezel. Then, pull the bezel out to remove it.

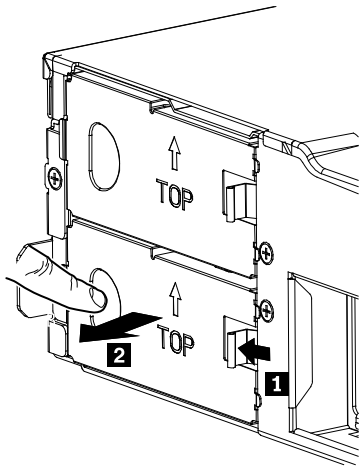


Figure 44. Removing the bay bezel for the power supply

2. Slide the power supply into the chassis until it snaps into position.

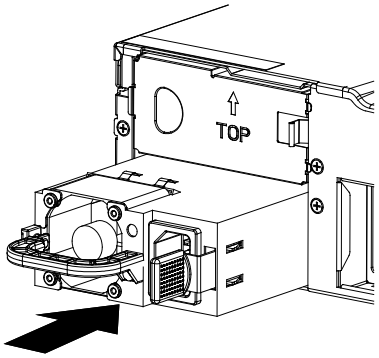


Figure 45. Installing the power supply

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to "Completing the parts replacement" on page 65.

Removing or installing the system fans

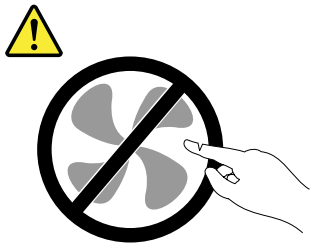
This section provides instructions on how to remove or install the system fans.

Removing the system fans

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to remove the system fans.

CAUTION:
Hazardous moving parts are nearby.



To remove the system fans, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See Removing the server cover.
3. Remove the microprocessor fan duct. See Removing the microprocessor fan duct.
4. Remove the riser card assembly. See “Removing the riser card assembly” on page 34.
5. Disconnect the system fan cables from the system board. See Locating other connectors on the system board.
6. For each system fan, press it downward while holding the buckle **1**. Then, carefully lift the system fan straight up to remove it out of the chassis **2**.

   Note: Mind the system fan cables. Remove the cables from any clip before removing the system fans.

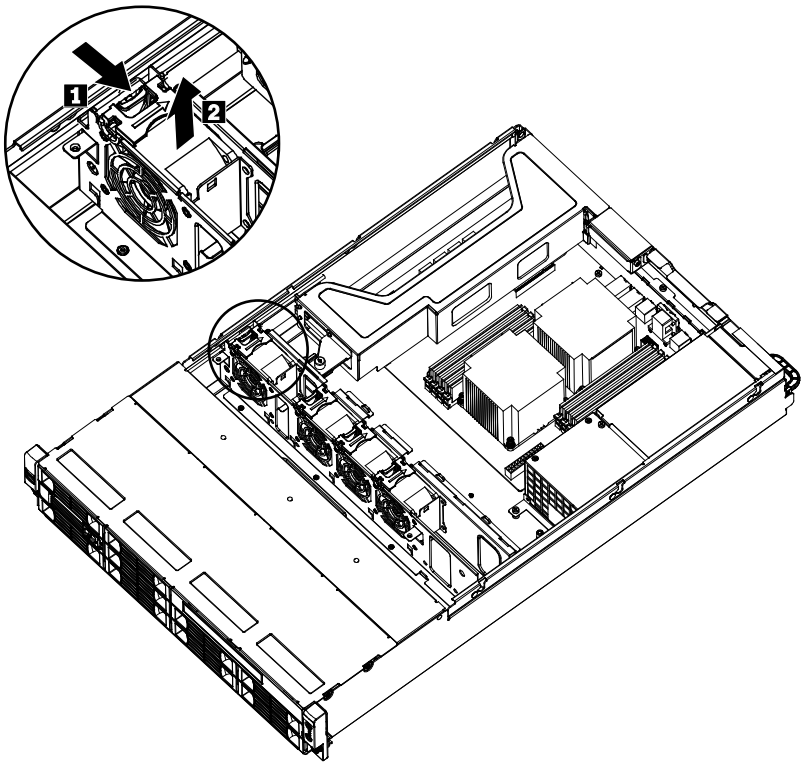


Figure 46. Removing the system fans

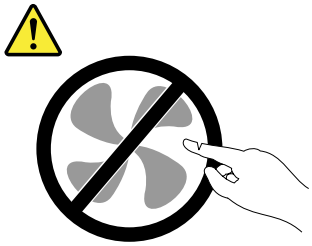
7. If you are instructed to return the system fans, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.
8. To install new system fans, see Installing the system fans.

Installing the system fans

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 17.

This section provides instructions on how to install the system fans.

CAUTION:
Hazardous moving parts are nearby.



To install the system fans, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See Removing the server cover.
3. Remove the microprocessor fan duct. See Removing the microprocessor fan duct.
4. Remove the riser card assembly. See “Removing the riser card assembly” on page 34.
5. For each system fan, slide it into the chassis from the top until it snaps into position.

6. Connect the system fan cables to the system board. For system fan connectors on the system board, see Locating other connectors on the system board.

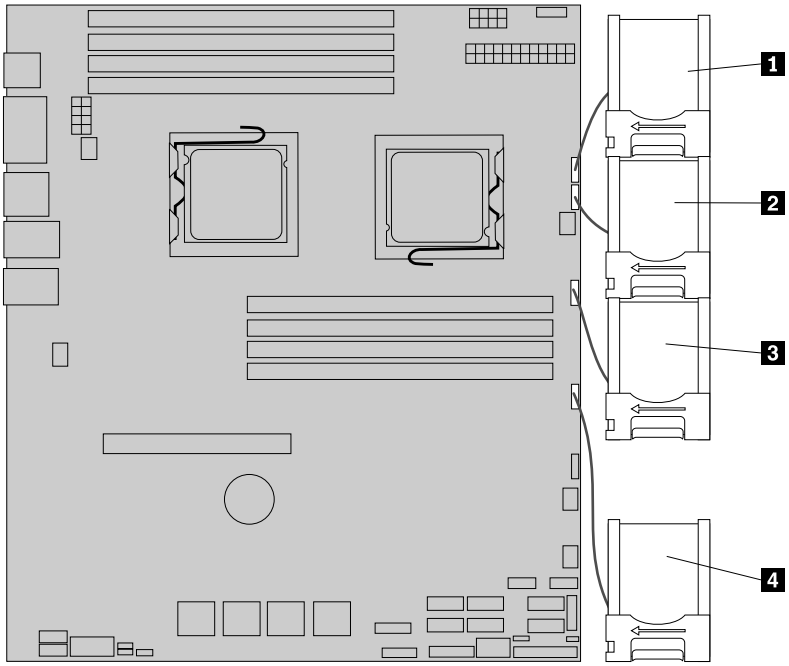


Figure 47. Installing the system fans

7. Secure the system fan cables to their corresponding clips.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 65.

Removing or installing the heat sink

This section provides instructions on how to remove or install the heat sink.

Removing the heat sink

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 17.

This section provides instructions on how to remove the heat sink.

CAUTION:

The heat sink might be very hot. Turn off the server and wait three to five minutes to let the server cool before removing the server cover.

To remove the heat sink, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 19.
3. Remove the microprocessor fan duct. See Removing the microprocessor fan duct.
4. Loosen the four screws that secure the heat sink and then carefully lift the heat sink out of the chassis.

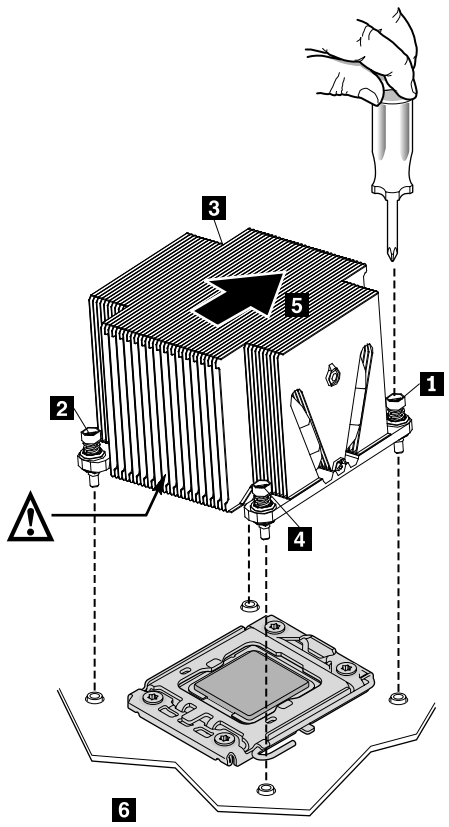


Figure 48. Removing the heat sink

1 - **4** Screws

5 Air flow

6 The front of the chassis

5. If you are instructed to return the heat sink, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.
6. To install the heat sink, see Installing the heat sink.

Installing the heat sink

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 17.

This section provides instructions on how to install the heat sink.

CAUTION:

The heat sink might be very hot. Turn off the server and wait three to five minutes to let the server cool before removing the server cover.

To install the heat sink, do the following:

Note: Make sure that you have already connected the front fans to the system board before you install the heat sink.

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 19.
3. Notice the orientation of the heat sink air flow and the V-shaped cooling pipe. The V-shaped cooling pipe should always face the power supply assembly. Then, align the retaining screws on the heat sink with the corresponding holes in the system board. Install the four screws following the numerical sequence as shown below (1 to 4) to secure the heat sink on the system board.

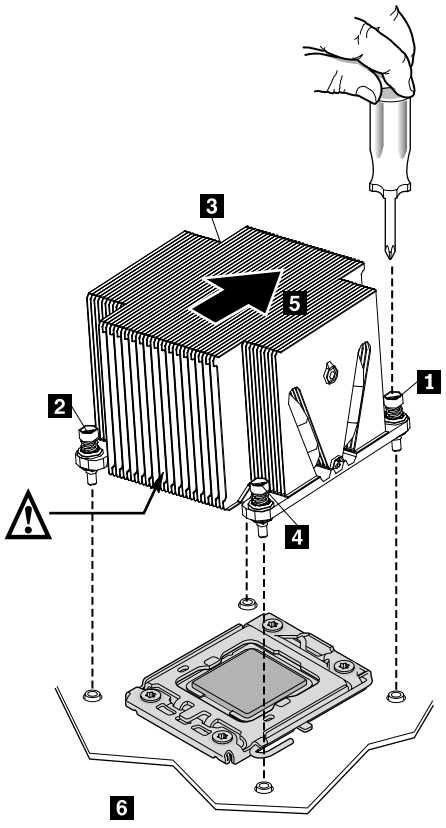


Figure 49. Installing the heat sink

1 - 4 Screws

5 Air flow

6 The front of the chassis

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 65.

Removing or installing the microprocessor

This section provides instructions on how to remove or install the microprocessor.

Removing the microprocessor

Attention: Do not open your server or attempt any repair before reading and understanding the “Safety information” on page iii and “Guidelines” on page 17.

This section provides instructions on how to remove the microprocessor.

CAUTION:

The heat sink and microprocessor might be very hot. Turn off the server and wait three to five minutes to let the server cool before removing the server cover.

To remove the microprocessor, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 19.
3. Remove the microprocessor fan duct. See Removing the microprocessor fan duct.
4. Remove the heat sink. See “Removing the heat sink” on page 58.

5. Lift the small handle and open the retainer to access the microprocessor. Then, carefully lift the microprocessor straight up and out of the socket, and place it on a static-protective surface.

   Note: Touch only the edges of the microprocessor.

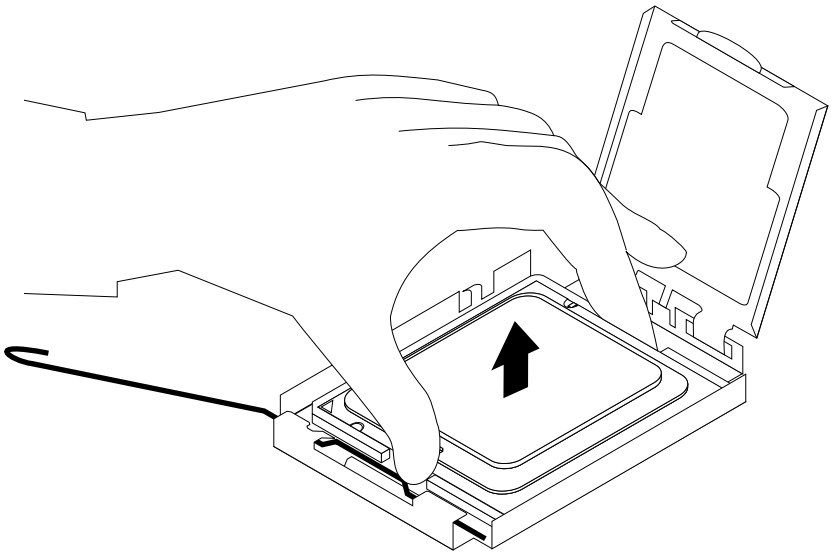


Figure 50. Removing the microprocessor

6. If you are instructed to return the microprocessor, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to "Completing the parts replacement" on page 65.

Installing the microprocessor

Attention: Do not open your server or attempt any repair before reading and understanding the "Safety information" on page iii and "Guidelines" on page 17.

This section provides instructions on how to install the microprocessor.

CAUTION:

The heat sink and microprocessor might be very hot. Turn off the server and wait three to five minutes to let the server cool before removing the server cover.

For optimal performance, follow these microprocessor installation rules:

1. When two microprocessors are installed, both must have the same core voltage and core speed.
2. When only one microprocessor is installed, it must be in the socket labeled CPU0. The other socket must be kept empty.

3. Always install the microprocessor first into the CPU0 socket, and then install another microprocessor into the CPU1 socket if you want to install two microprocessors.

To install the microprocessor, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 19.
3. Remove the microprocessor fan duct. See Removing the microprocessor fan duct.
4. Remove the heat sink. See Removing the heat sink.
5. Press down and push the small handle outward on the microprocessor socket to lift the handle to the open position.

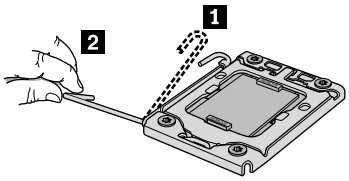


Figure 51. Lifting the handle

6. Gently press the retainer of the microprocessor socket to open it.

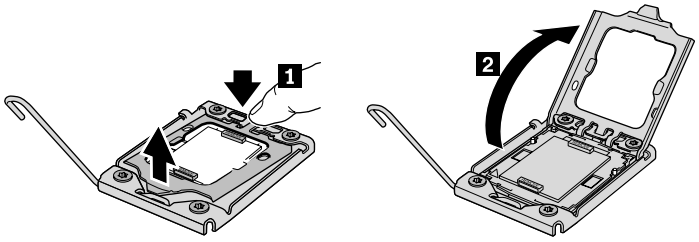


Figure 52. Opening the retainer

7. Remove the protective cover from the microprocessor socket. To avoid damaging the pins in the microprocessor socket, do not touch the pins while removing the cover.

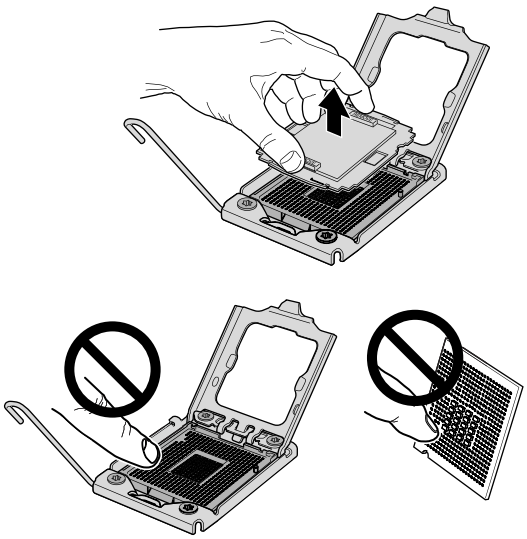


Figure 53. Removing the microprocessor socket cover

8. Remove the new microprocessor from the protective cover that protects the gold contacts on the bottom of the new microprocessor.

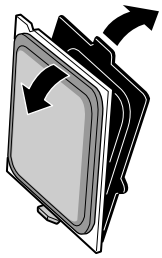


Figure 54. Removing the new microprocessor from the protective cover

9. Hold the new microprocessor by the edges and align the notches 1 on it with the tabs 2 in the microprocessor socket. Then, install the microprocessor into the socket.

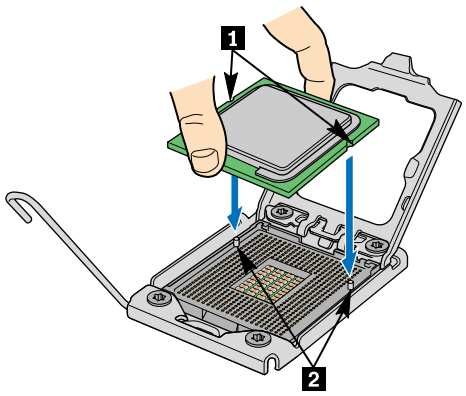


Figure 55. Installing the microprocessor

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 65.

Completing the parts replacement

This section provides instructions to help you complete the parts replacement and turn on your server.

To complete the parts replacement, you must reinstall the server cover, reconnect all the cables and, for some devices, run the Setup Utility program to do further setup.

Installing the server cover

This section provides instructions on how to install the server cover.

Attention: For proper cooling and airflow, install the server cover before turning on the server. Operating the server for extended periods of time (more than 30 minutes) with the cover removed might damage server components.

To install the server cover, do the following:

1. Make sure that all cables, add-on cards, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server. Also, make sure that all internal cables are correctly routed.
2. Position the server cover on the chassis so that the rail guides on the bottom of the server cover engage the rails. Then, slide the server cover to the front of the server until it snaps into position and is closed. Then, tighten the thumbscrew to secure the server cover.

   Note: Although the server cover is secured by a thumbscrew, for safety consideration, be sure to use a tool, for example a screw driver, to tighten the thumbscrew and always make sure that the thumbscrew is securely installed. Also, do not over-tighten the thumbscrew.

Connecting the cables

Attention: To prevent damage to equipment, connect the power cords last.

If the server cables and connector panel have color-coded connectors, match the color of the cable end with the color of the connector. For example, match a blue cable end with a blue panel connector, a red cable end with a red connector, and so on. See “Rear view” on page 10 for an illustration of the I/O connectors on the rear of the server.

Turning on the server

When the server is connected to an ac power source but is not turned on, the operating system does not run, and all core logic except for the service processor (the integrated management module) is shut down; however, the server can respond to requests to the service processor, such as a remote request to turn on the server. The power-on LED flashes to indicate that the server is connected to an ac power source but is not turned on.

Approximately five seconds after the server is connected to ac power, one or more fans might start running to provide cooling while the server is connected to power and the power-on button LED flashes quickly. Approximately one to three minutes after the server is connected to ac power, the power-control button becomes active (the power-on LED flashes slowly), and one or more fans might start running to provide cooling while the server is connected to power. Then, you can turn on the server by pressing the power button on the front control panel. See “Front control panel” on page 11.

Updating the server configuration

When you turn on the server for the first time after you add or remove a device, you might receive a message saying that the configuration has been changed. The Setup Utility program starts automatically so that you can save the new configuration settings. For more information, see Chapter 6 “Configuring the server” on page 69.

Some optional devices have device drivers that you must install. For information about installing device drivers, see the documentation that comes with each device.

The server comes with at least one microprocessor. If more than one microprocessor is installed, the server can operate as a symmetric multiprocessing (SMP) server. You might have to upgrade the operating system to support SMP. For more information, see the operating-system documentation.

If the server has an optional RAID controller and you have installed or removed a hard disk drive, see the documentation that comes with the RAID controller for information about reconfiguring the disk arrays.

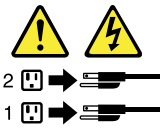
Turning off the server

When you turn off the server and leave it connected to ac power, the server can respond to requests to the service processor, such as a remote request to turn on the server. While the server remains connected to ac power, one or more fans might continue to run. To remove all power from the server, you must disconnect it from the power source.

Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

Statement 5

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



The server can be turned off in any of the following ways:

- You can turn off the server from the operating system, if your operating system supports this feature. After an orderly shutdown of the operating system, the server will turn off automatically.
- You can press the power button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.
- If the operating system stops functioning, you can press and hold the power button for more than four seconds to turn off the server.
- The server can be turned off by the Shutdown on LAN feature.
- The integrated management module (IMM) can turn off the server as an automatic response to a critical system failure.

Connecting external devices

If you install a supported optional adapter, you can attach external devices to the server.

To attach an external device, do the following:

Note: If you are attaching an external device, see the documentation that comes with the device for information about cabling.

1. Read and understand the *Safety Information* on the *ThinkServer Documentation DVD* that comes with your product, and “Guidelines” on page 17. To obtain a copy of the publications, go to: http://www.lenovo.com/support
2. Turn off the server and all attached devices.
3. Follow the instructions that come with the device to prepare it for installation and to connect it to the server.

Chapter 6. Configuring the server

Lenovo provides the following programs for you to configure your server:

- **Setup Utility program:** The Setup Utility program is part of the server firmware. You can use the Setup Utility program to view your server configuration, change the startup device sequence, set the date and time, and set passwords. For information about using this program, see “Using the Setup Utility program” on page 69.
- **Ethernet controller configuration:** For information about configuring the Ethernet controller, see “Configuring the Gigabit Ethernet controller” on page 84.
- **LSI onboard SAS controller Configuration Utility program:** Use the LSI onboard SAS controller Configuration Utility program to configure the onboard 1068E SAS RAID controller with RAID capabilities and the devices that are attached to it. For information about using this program, see Onboard 1068E SAS RAID controller Configuration Utility program.
- **Add-on SAS RAID controller Configuration Utility program:** Use the add-on SAS RAID controller Configuration Utility program to configure the supported RAID controller with RAID capabilities and the devices that are attached to it. For information about using this program, see the *MegaRAID SAS Software User Guide* on the documentation DVD that came with you server.

The following table lists the different server configurations and the applications that are available for configuring and managing RAID arrays.

Table 10. Server configurations and applications for configuring and managing RAID arrays

Server configuration	RAID array configuration (before operating system is installed)	RAID array management (after operating system is installed)
Onboard 1068E SAS RAID adapter	LSI IR-RAID Utility (press Ctrl+C to start)	MegaRAID Storage Manager (MSM)
ThinkServer 8708ELP SAS RAID adapter	LSI MegaRAID WebBIOS Configuration Utility (press Ctrl+H to start)	MegaRAID Storage Manager (MSM)
ThinkServer 8708EM2 SAS RAID adapter	LSI MegaRAID WebBIOS Configuration Utility (press Ctrl+H to start)	MegaRAID Storage Manager (MSM)

Using the Setup Utility program

Use the Setup Utility program to perform the following tasks:

- View configuration information
- View and change assignments for devices and I/O ports
- Set the date and time
- Set the startup characteristics of the server and the order of startup devices
- Set and change settings for advanced hardware features
- View, set, and change settings for power-management features
- View and clear error logs
- Resolve configuration conflicts

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Starting the Setup Utility program

To start the Setup Utility program, do the following:

1. Approximately three minutes after the server is connected to a working electrical outlet, the power button becomes active. Turn on the server and the POST runs automatically. You will then see the logo screen. The POST is a set of tests and procedures that are performed each time you turn on your server.
2. Press Del as soon as you see the logo screen. The Setup Utility program opens. If you have set an administrator password, you must type the administrator password to access the full Setup Utility program menu. If you do not type the correct administrator password, a limited Setup Utility program menu is available.

   Note: You can also press TAB as soon as you see the logo screen to review the POST process and information.
3. The Setup Utility program menu lists various items about the system configuration settings. Select the settings to view or change.

When working with the Setup Utility program, you must use the keyboard. The keys used to perform various tasks are displayed at the bottom of each screen.

Note: Use the default setting for any item you are not familiar with. Do not change the value of unfamiliar items or items that are not mentioned in this manual to avoid any unexpected problems. If you cannot turn on the server because of incorrect BIOS settings, refer to Jumper settings and use the jumpers to clear CMOS and recover to the factory default settings.

Introduction of the BIOS items

The following tables list all the main menus and items in the Setup Utility program. Some items might vary because of the BIOS updates.

Notes:

1. Use the default setting for any item you are not familiar with. Do not change the value of unfamiliar items or items that are not mentioned in this manual to avoid any unexpected problems. If you cannot turn on the server because of incorrect BIOS settings, use the jumpers on the system board to clear CMOS and recover to the factory default settings.
2. After updating the BIOS, all the BIOS settings become the default settings of the updated BIOS version. You need to check and reconfigure the BIOS settings for your specific needs.

Table 11. The Setup Utility program main menu

Item	Description
Main	Set the basic BIOS parameters.
Advanced	Set the advanced BIOS parameters.
PCIPnP	Set the PCI parameters.
Boot	Set the boot parameters.
Security	Set the security parameters.
Chipset	Set the chipset.
Exit	Exit the Setup Utility program.

Table 12. Items under the **Main** *menu*

Item	Option	Description
AMIBIOS		View the BIOS version and creation date information.
Processor		View microprocessor information.
System Memory		View memory capacity information.
System Time	HH:MM:SS	Set system time.
System Date	MM/DD/YYYY	Set system date.

Table 13. Items under the **Advanced** *menu*

Item	Description
CPU Configuration	Enter the submenu to see all the options. See Submenus under the **CPU Configuration**.
Mass Storage Controller Configuration	Enter the submenu to see all the options. See Submenus under the **Mass Storage Controller Configuration**.
SuperIO Configuration	Enter the submenu to see all the options. See Submenus under the **SuperIO Configuration**.
USB Configuration	Enter the submenu to see all the options. See Submenus under the **USB Configuration**.
Hardware Health Configuration	Enter the submenu to see all the options. See Submenus under the **Hardware Health Configuration**.
IPMI 2.0 Configuration	Enter the submenu to see all the options. See Submenus under the **IPMI 2.0 Configuration**.
Intel VT-d Configuration	Enter the submenu to see all the options. See Submenu under the **Intel VT-d Configuration**.
Remote Access Configuration	Enter the submenu to see all the options. See Table 21 “Submenus under the **Remote Access Configuration**” on page 75
System Information	View the system information, including the machine type and model, serial number, asset tag, and UUID.
Note: Do not change any unfamiliar item value under the **Advanced** menu.	

Table 14. Submenus under the **CPU Configuration**

Item	Option	Description
C1E Support	Disabled / [Enabled]	Enable or disable the C1E function of the microprocessor. This setting might impact system performance.
Hardware Prefetcher	Disabled / [Enabled]	Enable or disable the prefetch function of the microprocessor. This setting might impact system performance.
Adjacent Cache Line Prefetch	Disabled / [Enabled]	Enable or disable the adjacent cache line prefetch. This setting might impact system performance.
MPS and ACPI MADT ordering	Legacy ordering / [Modern ordering]	Select the MPS and ACPI MADT ordering method.

Table 14. Submenus under the **CPU Configuration** *(continued)*

Item	Option	Description
Intel® Virtualization Tech	Disabled / [Enabled]	Enable or disable the Intel Virtualization Tech. This technology can provide additional capacity for hardware computing. If you set this feature to **Enabled**, you have to turn off the server and disconnect the power cord from electrical outlet, and then reconnect the power cord and turn on the server to make this feature take effect.
Execute-Disable Bit Capability	Disabled / [Enabled]	Enabling the Execute-Disable Bit Capability can prevent the executive code of some malicious software from using the data page.
Intel® HT Technology	[Enabled] / Disabled	Enable or disable the hyper-thread technology. (Whether your server supports this feature or not is depending on the type of the installed microprocessor.)
Active Processor Cores	[All] / 1 / 2	Enable or disable the multi-core processing function.
Intel® SpeedStep™ tech	Disabled / [Enabled]	Enable or disable the SpeedStep technology.
Intel® TurboMode tech	Disabled / [Enabled]	Enable or disable the Turbo Mode technology.
Intel® C-STATE tech	Disabled / [Enabled]	Enable or disable the C-STATE technology.
C3 State	Disabled / [ACPI C2] / ACPI C3	Set the microprocessor C3 state mode.
C6 State	Disabled / [Enabled]	Enable or disable the C6 state of the microprocessor.
C State package limit setting	[Auto] / C1 / C3 / C6 / C7	Set the C state package limit.
C1 Auto Demotion	Disabled / [Enabled]	Enable or disable the C1 State Demotion of the microprocessor.
C3 Auto Demotion	Disabled / [Enabled]	Enable or disable the C3 State Demotion of the microprocessor.
ACPI T State	Disabled / [Enabled]	Enable or disable the microprocessor throttling in ACPI.

Notes:

1. The settings in [ ] are the default settings in the Setup Utility program.
2. The above options might vary depending on the type of the installed microprocessor.

Table 15. Submenus under the **Mass Storage Controller Configuration**

Item	Option	Description
SATA Configuration	Disabled / [Enabled]	Enable or disable the integrated SATA controller.
Configure SATA as	[IDE] / RAID	To select the hard disk drive mode. If this option is set to **IDE**, all the SATA connectors will be configured as stand-alone SATA connectors.
Notes: 1. The settings in [ ] are the default settings in the Setup Utility program. 2. The **SATA Configuration** item might not apply because your server came with an integrated SAS controller.		

Table 16. Submenus under the **SuperIO Configuration**

Item	Option	Description
Serial Port1 Address	Disabled; [3F8/IRQ4]; 3E8/IRQ4; 2E8/IRQ3	Select the I/O base address and interrupt for serial port 1.
Serial Port2 Address	Disabled; [2F8/IRQ3]; 3E8/IRQ4; 2E8/IRQ3	Select the I/O base address and interrupt for serial port 2.
Note: The settings in [ ] are the default settings in the Setup Utility program.		

Table 17. Submenus under the **USB Configuration**

Item	Option	Description
Legacy USB Support	Disabled / [Enabled] / Auto	Enable or disable the support on legacy USB devices.
USB 2.0 Controller Mode	FullSpeed / [HiSpeed]	Select the USB speed.
Hotplug USB FDD Support	Disabled / Enabled / [Auto]	Enable or disable the support on the hot-swap USB diskette drive.
Note: The settings in [ ] are the default settings in the Setup Utility program.		
For external USB devices, the **USB Mass Storage Device Configuration** submenu is as below:		
Emulation Type	[Auto] / Floppy / Forced FDD / Hard Disk / CDROM	Select the type of the USB device.

Table 18. Submenus under the **Hardware Health Configuration**

Item	Option	Description
Items and options with BMC configuration:		
Auto Fan Control	Disabled / [Enabled]	If this option is set to **Disabled**, the fan runs at the full speed; if this option is set to **Enabled**, the fan speed is controlled by the system temperature.
PWM Minimal Duty Cycle	[60% Duty Cycle] / 45% Duty Cycle / 30% Duty Cycle	Select the PWM Minimal Duty Cycle for the fan: 60%-100%, 45%-100%, or 30%-100%.
Sensor Data Register Monitoring	Read Only	The sensor data in this option is for read only. The detected data includes the temperature, voltage and fan speed.
Items and options without BMC configuration:		
H/W Health Function	Disabled / [Enabled]	Enable or disable the hardware monitor function.
Auto FAN Control	Disabled / [Enabled]	If this option is set to **Disabled**, the fan runs at the full speed; if this option is set to **Enabled**, the fan speed is controlled by the system temperature.
PWM Minimal Duty Cycle	[60% Duty Cycle] / 45% Duty Cycle / 30% Duty Cycle	Select the PWM Minimal Duty Cycle for the fan: 60%-100%, 45%-100%, or 30%-100%.
Fan Failure LED Indication	Disabled / [Enabled]	Enable or disable the fan alarm function. If this option is set to **Enabled**, a message about fan failure will be displayed on the POST screen when the rotational speed of each fan is less than 800 rpm.
Hardware Health Event Monitoring	Read Only	The sensor data in this option is for read only. The detected data includes the temperature and system fan rotational speed.
Note: The settings in [ ] are the default settings in the Setup Utility program.		

Table 19. Submenus under the **IPMI 2.0 Configuration**

Item	Sub-item	Option	Description
View BMC System Event Log			View the system event log.
Clear BMC System Event Log			Delete the system event log.
Set LAN Configuration			Set the IP address source, IP address, subnet mask, and gateway address.
Set PEF Configuration	PEF SUPPORT	Disabled / [Enabled]	Enable or disable the PEF support.

Table 19. Submenus under the **IPMI 2.0 Configuration** *(continued)*

Item	Sub-item	Option	Description
BMC Watch Dog Timer Action		[Disabled] / Reset System / Power Down / Power Cycle	Disable or enable the OS based dongle. If enabled, whenever any problems arising from the operation system, such as the system halted, the system management feature will take actions of Reset System, Power Down, or Power Cycle at the prompt of the dongle Timer.
BMC Alert LED and Beep		[Off] / On	Turn on or turn off the BMC alert LED and beep.
FW key		[0000000]	
Note: The settings in [ ] are the default settings in the Setup Utility program.			

Table 20. Submenu under the **Intel VT-d Configuration**

Item	Option	Description
Intel VT-d	Disabled / [Enabled]	Enable or disable the virtualization technology for I/O devices.
Note: The settings in [ ] are the default settings in the Setup Utility program.		

Table 21. Submenus under the **Remote Access Configuration**

Item	Option	Description
Remote Access	[Disabled] / Enabled	Enable or disable the serial port remote access.
Note: The settings in [ ] are the default settings in the Setup Utility program.		

Table 22. Items under the **PCIPnP** *menu*

Item	Option	Description
Clear NVRAM	[No] / Yes	If this option is set to **Yes**, that means to clear the NVRAM information when the system starts up.
Boots Graphic Adapter Priority	[Auto] / Onboard VGA	If this option is set to **Auto**, the external graphics card will be enabled firstly. If no external graphics card, the integrated graphics controller is automatically enabled. If this option is set to **Onboard VGA**, only the integrated graphics card is enabled.
LAN1	[Auto] / Enabled / Disabled	The **Auto** option means to automatically enable the integrated Ethernet controller 1. The **Enabled** option means to enable the integrated Ethernet controller 1. The **Disabled** option means to disable the integrated Ethernet controller 1.

Table 22. Items under the **PCIPnP** *menu (continued)*

Item	Option	Description
LAN1 OP-ROM	[Enabled] / Disabled	Enable or disable the wake-up from LAN 1.
LAN2	[Auto] / Enabled / Disabled	The **Auto** option means to automatically enable the integrated Ethernet controller 2. The **Enabled** option means to enable the integrated Ethernet controller 2. The **Disabled** option means to disable the integrated Ethernet controller 2.
LAN2 OP-ROM	[Enabled] / Disabled	Enable or disable the wake-up from LAN 2.
Note: The settings in [ ] are the default settings in the Setup Utility program.		

Table 23. Items under the **Boot** *menu*

Item	Sub-item	Option	Description
Boot Settings Configuration	Quick Boot	[Disabled] / Enabled	Enable or disable the quick boot feature.
	Quiet Boot	[Enabled] / Disabled	Enable or disable the feature to show OEM Logo during the POST.
	AddOn ROM Display Mode	[Force BIOS] / Keep Current	Set the AddOn ROM Display Mode.
	Bootup Num-Lock	[Off] / On	Set the Num-Lock LED state.
Boot Device Priority	1st Boot Device	Boot device names	Set the startup device sequence (support at most five startup devices).
	2nd Boot Device	Boot device names	
Hard Disk Drives	1st Drive2nd Drive...		Based on the installed hard disk drives.
CD/DVD Drives	1st Drive...		Based on the installed optical drives.
Note: The settings in [ ] are the default settings in the Setup Utility program.			

Table 24. Items under the **Security** *menu*

Item	Description
Change Supervisor Password	Set or change the supervisor password. The password can be any combination of up to 6 (1 to 6) alphabetic and numeric characters.
Change User Password	Set or change the user password. The password can be any combination of up to 6 (1 to 6) alphabetic and numeric characters.
Note: The settings in [ ] are the default settings in the Setup Utility program.	

Table 25. Items under the **Chipset** *menu*

Item	Sub-item	Option	Description
CPU Bridge Configuration	QPI Frequency	[Auto] / 4.800GT / 5.866GT / 6.400GT	Standard transferring rate of the QPI bus.
	QPI L0s and L1	Disabled / [Enabled]	Enable or disable the QPI L0s and L1.
	Memory Frequency	[Auto] / Force DDR-800 / Force DDR-1066 / Force DDR-1333	Set the frequency of the memory module. Make sure that the mandatory memory frequency setting is less than the maximum frequency that the memory module can support.
	Memory Mode	[Independent] / Channel Mirroring / Lockstep	Set the memory channel mode to improve reliability or efficiency.
South Bridge Configuration	Restore on AC Power Loss	Power Off / Power On / [Last State]	If the power is recovered after outage, the system will be at the state that you set under **Restore on AC Power Loss**.
Note: The settings in [ ] are the default settings in the Setup Utility program.			

Exiting the Setup Utility program

After you finish viewing or changing settings, press Esc to return to the Setup Utility program main menu. You might have to press Esc several times. Then, you can do one of the following:

- If you want to save the new settings and exit the Setup Utility program, press F10. Otherwise, your changes will not be saved.
- If you do not want to save the new settings, select **Exit → Discard Changes and Exit**.
- If you want to return to the default settings, press F9 or select **Exit → Load Optimal Defaults**.

Using passwords

By using the Setup Utility program, you can set a password to prevent unauthorized access to your server and data. The following options are available to help you set a supervisor password or a user password:

- **Change Supervisor Password**
- **Change User Password**

You do not have to set a password to use your server. However, using a password improves computing security. If you decide to set a password, read the following sections.

Password considerations

A password can be any combination of up to 6 (1 to 6) alphabetic and numeric characters. For security reasons, it is recommended to use a strong password that cannot be easily compromised. To set a strong password, use the following guidelines:

Note: The Setup Utility program passwords are not case sensitive.

- Have six characters in length
- Contain at least one alphabetic character and one numeric character
- Not be your name or your user name

- Not be a common word or a common name
- Be significantly different from your previous passwords

Setting, changing, or deleting a password

This section provides instructions on how to set, change, or delete a password.

To set, change, or delete a password, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 70.
2. From the Setup Utility program main menu, select **Security → Change Supervisor Password** or **Change User Password**.
3. Follow the instructions on the screen to set, change, or delete a password.

   Note: A password can be any combination of up to 6 (1 to 6) alphabetic and numeric characters. For more information, see “Password considerations” on page 77.

RAID controllers

The following table lists the various utilities available to configure RAID controllers before an operating system is installed.

Table 26. RAID utilities

RAID utilities	Description	Location	Where to find more information
EasyStartup	• For use with all factory-supported RAID controllers • Automatically detects hardware and lists all supported RAID configurations • Configures one disk array per controller using all drives currently attached to the controller • Created a RAID response file that can be used to configure RAID controllers on similarly configured Lenovo servers.	*ThinkServer EasyStartup* DVD	“Using the ThinkServer EasyStartup program” on page 79
LSI IR-RAID Utility	Onboard 1068E SAS RAID adapter	Press Ctrl+C to start	“Onboard 1068E SAS RAID controller Configuration Utility program” on page 81
LSI MegaRAID WebBIOS Configuration Utility	ThinkServer 8708ELP SAS RAID adapter or 8708EM2 RAID adapter	Press Ctrl+H to start	Refer to the *MegaRAID SAS Software User Guide* on the documentation DVD that came with you server. And you can find and install the MegaCLI program and the MegaRAID Storage Manager program in the *ThinkServer EasyStartup* DVD that came with your server. Insert the DVD into the optical drive and the files are in the \Tools And Utilities directory.

Using the ThinkServer EasyStartup program

The *ThinkServer EasyStartup* DVD simplifies the process of configuring your RAID controllers and installing an operating system. The program works in conjunction with your Windows or Linux operating-system installation disc to automate the process of installing the operating systems and associated device drivers.

If you did not receive an *ThinkServer EasyStartup* DVD with your server, you can download an image from the Lenovo Support Web site at http://www.lenovo.com/support.

The EasyStartup program has the following features:

- Self-booting DVD
- Easy-to-use, language-selectable interface
- Integrated help system
- Automatic hardware detection
- RAID configuration utility
- Device drivers provided based on the server model and detected devices
- Selectable partition size and file system
- Support for multiple operating systems
- Installs the operating system and device drivers in an unattended mode to save time
- Creates a reuseable response file that can be used with similarly configured Lenovo servers to make future installations even faster.

Before you use the EasyStartup DVD

Functionality and supported operating systems can vary with different versions of the EasyStartup program. To learn more about the version you have, do the following:

1. Insert the *ThinkServer EasyStartup* DVD and restart the server.
2. Advance to the Home screen.
3. Click **Compatability notes**. The compatability notes feature provides detailed information about the RAID controllers, operating systems, and server configurations supported by that version of the EasyStartup program.
4. Click **User Guide**. The User Guide provides an overview of the various functions provided by that version of the EasyStartup program.

Before using the EasyStartup program to install an operating system, make sure any external storage devices and fiber channels are configured correctly.

Setup and configuration

When you start the *ThinkServer EasyStartup* DVD, you will be prompted for the following:

- Select the language in which you want to view the program.
- Select the language of the keyboard you will be using with the program.

Note: The following language keyboards are supported: English, French, German, Spanish, Japanese, Turkish, Italian, and Dutch. Your *ThinkServer EasyStartup* DVD might be English only. In this case, the keyboard layout should be English.

You will then see one or more reminders about configuring storage devices, and then you will be presented with the Lenovo License Agreement. Read the license agreement carefully. You must agree with terms in order to continue.

After agreeing to the license agreement, you will be given the following choices:

- Continue to the main program interface
- Use a shortcut to install an operating system based a response file that you previously created using the EasyStartup program
- Use a shortcut to configure RAID controllers based on a RAID response file that you previously created using the EasyStartup program

If you continue to the main program interface, you will have the following selectable options:

- **Compatibility notes:** This selection provides information about the RAID controllers, operating systems, and server configurations supported by that version of the EasyStartup program.
- **User Guide:** This selection provides information about the features provided by that version of the EasyStartup program.
- **Hardware list:** This selection displays a list of hardware devices detected by the EasyStartup program.
- **Configure RAID:** This selection enables you to view the current RAID configuration for each installed RAID controller and make changes if needed.
- **Install operating system:** This selection displays a series of choices and prompts to collect information required for installation, prepares the hard disk for installation, and then initiates the installation process using the user-provided operating-system installation CD or DVD.
- **About:** This selection displays version information and legal notices.

Configuring RAID

The RAID configuration feature that is part of the EasyStartup program enables you to view and change RAID settings for supported RAID controllers. Through this feature, you have the ability to configure each installed controller. The program automatically detects the number of discs currently attached to the controller, determines the possible RAID configurations that can be configured, and prompts you through the steps to configure one or more disk arrays with or without hot-spare hard disk drives. As you configure each controller you will be given the option to save the RAID configuration settings to a RAID response file, which you can use on other similarly configured Lenovo servers. This method satisfies most users' needs.

Typical operating system installation

When you select **Install operating system**, you will be prompted for information required for the installation. The prompts vary depending on the operating system selected. This section describes the tasks associated with a typical Windows operating system installation. Each task must be completed in order before moving to the next task.

Note: Ensure that your RAID controller is correctly configured before you select an operating system to install.

- **Select operating system:** This task enables you to select the operating system that you will be installing.
- **Select disk:** This task enables you to select the disk where you want to install the operating system.

  Note: The disk that you select must be set as the boot disk in the Setup Utility program.
- **Partitions options:** This task enables you to choose whether you want to repartition the selected drive or use an existing partition.
- **Partition settings:** This task enables you to choose the file system type and define the partition size.

- **Installation settings:** This task prompts you for user and system settings, the operating system product key, and the administrator password.
- **Network settings:** This task prompts you for domain and workgroup settings, Ethernet controller type, IP address settings, DNS settings, and WINS address settings.
- **Install applications:** This task enables you to run custom commands or scripts at the end of the installation process and install the ThinkServer EasyManage program to help you manage your servers.
- **Install Windows components:** This task enables you to install optional Windows components such as IIS, ASP.NET, and SNMP.
- **Confirm settings:** This task enables you to review all of the information you provided.
- **Save response file:** This task gives you the option of saving the information on a diskette or USB device as a response file for future installations on similarly configured Lenovo servers.
- **Start installation:** This task starts the actual installation process. First, the disk is prepared using the disk and partition information you specified. Then you are prompted to insert the operating system disk, and the operating system is installed using the information that you specified.

Onboard 1068E SAS RAID controller Configuration Utility program

This section provides some basic instructions on how to configure the onboard SAS RAID for your RD240 server using the onboard 1068E SAS RAID controller Configuration Utility program.

Installing the SAS SGPIO cables

The connectors J51 and J21 on the system board are for the SAS SGPIO cables. You can connect the SGPIO port 1-4 of the mini-SAS cables to the J51 connector and connect the SGPIO port 5-8 of the mini-SAS cables to the J21 connector. See “Locating parts on the system board” on page 14.

Starting the Configuration Utility program

During the POST, when the message “Press Ctrl-C to start LSI Logic Configuration Utility...” is displayed, press Ctrl+C to enter the main menu for SAS settings. Press Enter and the Adapter List window is displayed. In this window, you can view the controller list, view the hard disk drive information, and configure RAID.

When working with this program, you must use the keyboard. The keys used to perform various tasks are displayed at the bottom of each screen.

Table 27. Items in the Adapter List window

Item	Description
Adapter	Detected SAS adapter.
PCI Bus	The PCI bus number assigned for the adapter.
Dev/Fnc	The PCI Device/Function assigned for the adapter.
FW Revision	Indicates the current Firmware version.
Status	Indicates that the adapter in the boot list is enabled or disabled.
Boot Order	Indicates the boot sequence. You can change the sequence by pressing + or -.

You can press Alt+N to switch to the Global Properties window to set the properties of boot and interrupt.

Table 28. Items on the Global Properties window

Item	Description
Pause When Boot Alert Displayed	Indicates stop the boot or not when the alert occurs during the boot. The current property can be changed by pressing + or -. The option **No** indicates that you can continue to boot when the alert occurs. The option **Yes** indicates that you can pause boot when the alert occurs and press any key to continue.
Boot Information Display Mode	Defines how much BIOS information to be displayed during the boot. The current property can be changed by pressing + or -.
Support Interrupt	Indicates the supported interrupt mode. **Hook interrupt, the Default** is the default value, which supports the boot from CD-ROM in the floppy emulation mode.
Restore Defaults	Restores the defaults.

Accessing the Adapter Properties window

In the Adapter List window, select **C1068E** and press Enter. The Adapter Properties window for SAS1068E opens.

Table 29. Items in the Adapter Properties window for SAS1068E

Item	Description
Adapter	Detected SAS adapter.
PCI Slot	The PCI slot number assigned for the adapter.
PCI Address (Bus/Dev)	The PCI Device/Function assigned for the adapter.
MPT Firmware Revision	Indicates the current Firmware version.
SAS Address	Indicates the current SAS address.
Status	Indicates that the adapter in the boot list is enabled or disabled.
Boot Order	Indicates the boot sequence.
Boot Support	Set the software controlling mode of the controller. The **Enabled BIOS & OS** means that the adapter is controlled by both the BIOS and the driver in the operating system. The **Enabled BIOS Only** means that the adapter is controlled only by the BIOS, instead of the driver in the operating system. This option might not be supported by all the operation systems, such as Windows operating systems. The **Enabled OS Only** means that the adapter is controlled only by the operating system. The **Disabled** means that the adapter is disabled.
RAID Properties	Set the Host RAID. See “SAS RAID settings” on page 83.
SAS Topology	Set the SAS hard disk drives. See “Accessing the SAS Topology window” on page 84.
Advanced Adapter Properties	Set the advanced properties of the adapter.
Note: To make any of the settings take effect, you need to restart the server.	

SAS RAID settings

In the Adapter Properties window, select **RAID Properties** and press Enter. The main window for SAS RAID setup is displayed.

The following list describes the items in the main window for SAS RAID setup:

- Create IM Volume: create RAID 1 including two hard disk drives to reserve data. The default Status of the first hard disk drive is Primary.
  The RAID 1 is also known as mirror image. The same data is written to the two hard disk drives at the same time, which, however, operates as a single logical hard disk drive in the operation system. Therefore, if one of the hard disk drives failed, the other retains a complete copy of the data. The server can still work normally. The data can be read from the two hard disk drives at the same time to improve the speed of reading the hard disk drives. The RAID 1 only supports the even number of hard disk drives.
- Create IME Volume: create RAID 1E, which can support the odd number of hard disk drives configured in RAID1. The number of the hard disk drives can be three to eight.
  The RAID 1E mode stores data on all hard disk drives through stripping and mirroring. The RAID 1E supports the odd number of the hard disk drives to form an array, while at least three hard disk drives are required and at most eight hard disk drives are required. The volume is n/2.
- Create IS Volume: create RAID 0, which supports two to eight hard disk drives.
  The RAID 0 provides the non-redundant disk array with maximum I/O performance by reading and writing the hard disk drives at the same time. With accessing to multiple hard disk drives at the same time, RAID 0 reduces the time delay caused by the hard disk drive mechanical system. It can improve the performance of read and write operation. However, due to the lack of the feature of the data redundancy, if any of the hard disk drives in the array failed, it will cause data loss.

Creating or deleting the RAID 1 array

This section uses RAID 1 as an example to guide you to create or delete SAS RAID using the LSI Configuration Utility program.

Creating the RAID 1 array

This section provides instructions on how to create RAID 1 using the LSI Configuration Utility program.

To create RAID 1, do the following:

1. In the SAS RAID setup main window, select **Create IM Volume** and press Enter. The Create New Array window opens.
2. Select **No** under the **RAID Disk** column for the first hard disk drive. Then, press the Space key.
3. When prompted, select **M** to set the first hard disk drive as the primary hard disk drive.

   Note: If you want to set the first hard disk drive as the slave hard disk drive, select **D**.
4. Press M to go back to the Create New Array window. Select **No** under the **RAID Disk** column for the second hard disk drive. Then, press the Space key and a warning message will be displayed. Press the Space key to go back to the Create New Array window.
5. Press C to create the array and select **Save changes then exit this menu** when prompted to save changes and exit.
6. After creating the array, you can select **RAID Properties** in the Adapter Properties window and press Enter to access the SAS RAID configuration main window and view the array information.

Deleting the RAID 1 array

This section provides instructions on how to delete a RAID array (RAID 1) you have created using the LSI Configuration Utility program.

To delete a RAID array (RAID 1), do the following:

1. Select **RAID Properties** in the Adapter Properties window and press Enter to access the SAS RAID configuration main window and view the array information.
2. Select **Manage Array** in the View Array window. Then, the Manage Array window opens.
3. Select **Delete Array** in the Manage Array window and press Enter. When the message for confirmation is displayed, press Y. The array is deleted.

Accessing the SAS Topology window

This section provides instructions on how to access the SAS Topology window.

To access the SAS Topology window, do the following:

1. Select **SAS Topology** in the Adapter Properties window and press Enter. The SAS Topology window opens.
2. Select **Direct Attached Devices** in the SAS Topology window and press Enter to view the information.
3. Follow the instructions on the screen to perform other tasks. The keys used to perform various tasks are displayed at the bottom of each screen.

Configuring the Gigabit Ethernet controller

The Ethernet controllers are integrated on the system board. They provides an interface for connecting to a 10 Mbps, 100 Mbps, or 1 Gbps network and provides full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network. If the Ethernet ports in the server supports auto-negotiation, the controllers detect the data-transfer rate (10BASE-T, 100BASE-TX, or 1000BASE-T) and duplex mode (full-duplex or half-duplex) of the network and automatically operates at that rate and mode.

You do not have to set any jumpers or configure the controllers. However, you must install a device driver to enable the operating system to address the controllers.

Updating the firmware

The firmware in the server is periodically updated and is available for download on the Lenovo Support Web site. Go to http://www.lenovo.com/support to check for the latest level of firmware, such as the BIOS ROM file, BMC FW and RAID FW files.

When you replace a device in the server, you might have to either update the server with the latest version of the firmware that is stored in memory on the device or restore the pre-existing firmware from a diskette or CD image.

- The BIOS ROM file is stored in flash on the system board.
- The Ethernet firmware is stored in EEPROM on the Ethernet controller.
- The integrated SAS controller firmware is stored in the ROM of SAS controller on the system board.
- The SAS RAID card firmware is stored in ROM on the SAS RAID card.

The Ethernet firmware is downloadable at http://www.lenovo.com/support.

Using the EasyUpdate Firmware Updater program

ThinkServer EasyUpdate Firmware Updater is a software application that enables you to maintain your system firmware up to date and helps you avoid unnecessary outages. Firmware Updater updates the server system and adapter firmware.

To update your system, do the following:

1. Go to http://www.lenovo.com/support.
2. Click **Download & Drivers → ThinkServer** and then follow the instructions on the Web page to download the ISO image for the EasyUpdate Firmware Updater program.
3. Burn the ISO image to a disc.
4. Set the optical drive as the first boot device and insert the disc into the optical drive. The server will proceed directly to the User Interface Application's introductory screen.
5. Read the messages and instructions displayed on the introductory screen. Then, click **Next** to proceed to the list of firmware updates available on the optical media.
6. Click **Apply** to begin the updates (click **Cancel** if you want to abort the updates and exit). All updates will run to completion, with each updater's native user interface kept visible to the user. When the User Interface Application regains control, you will see the results screen.

Before distributing the firmware update to other servers, ensure that your server can restart successfully without encountering hardware problems.

Installing the ThinkServer EasyManage program

To install the ThinkServer EasyManage Agent, you must already have a core server running the ThinkServer EasyManage Core Server program. The ThinkServer EasyManage Agent must be installed from that core server. Refer to the ThinkServer EasyManage Core Server documentation about Agent deployment for instructions on the various ways to deploy the ThinkServer EasyManage Agent to your new server.

Also, the ThinkServer EasyStartup program provides an option to install the ThinkServer EasyManage Agent as part of the operating system installation process.

Chapter 7. Troubleshooting

This chapter describes the diagnostic tools that are available to help you solve problems that might occur in the server.

If you cannot diagnose and correct a problem by using the information in this chapter, see Appendix B “Getting help and technical assistance” on page 103 for more information.

Troubleshooting tables

Use the troubleshooting tables to find solutions to problems that have identifiable symptoms.

If you have just added new software or a new optional device and the server is not working, complete the following steps before you use the troubleshooting tables:

1. Check the operator information panel.
2. Remove the software or device that you just added.
3. Reinstall the new software or new device.

DVD drive problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Symptom	Action
The DVD drive is not recognized.	1. Make sure that: • The SATA channel to which the DVD drive is attached (primary or secondary) is enabled in the Setup Utility program. • All cables and jumpers are installed correctly. • The signal cable and connector are not damaged and the connector pins are not bent. • The correct device driver is installed for the DVD drive. 2. Reseat the following components: a. DVD drive b. DVD drive cables 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. DVD drive b. DVD drive and cables c. (Trained service technician only) System board
A DVD is not working correctly.	1. Clean the DVD. 2. Reseat the DVD drive. 3. Replace the DVD drive.

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Symptom	Action
The DVD drive tray is not working.	1. Make sure that the server is turned on. 2. Insert the end of a straightened paper clip into the manual tray-release opening. 3. Reseat the DVD drive. 4. Replace the DVD drive.

General problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).
- If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.

Symptom	Action
A cover lock is broken, an LED is not working, or a similar problem has occurred.	If the part is a CRU, replace it. If the part is a FRU, the part must be replaced by a trained service technician.

Hard disk drive problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).
- If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.

Symptom	Action
Not all drives are recognized by the hard disk drive diagnostic tests.	Remove the drive that is indicated by the diagnostic tests; then, run the hard disk drive diagnostic tests again. If the remaining drives are recognized, replace the drive that you removed with a new one.
The server stops responding during the hard disk drive diagnostic test.	Remove the hard disk drive that was being tested when the server stopped responding, and run the diagnostic test again. If the hard disk drive diagnostic test runs successfully, replace the drive that you removed with a new one.
A hard disk drive was not detected while the operating system was being started.	Reseat all hard disk drives and cables; then, run the hard disk drive diagnostic tests again.

Intermittent problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).
- If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.

Symptom	Action
A problem occurs only occasionally and is difficult to diagnose.	1. Make sure that: • All cables and cords are connected securely to the rear of the server and attached devices. • When the server is turned on, air is flowing from the fan grille. If there is no airflow, the fan is not working. This can cause the server to overheat and shut down. 2. Check the system-event log (see “Event logs” on page 98). 3. See “Solving undetermined problems” on page 97.

Keyboard, mouse, or pointing-device problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Symptom	Action
All or some keys on the keyboard do not work.	1. Make sure that: • The keyboard cable is securely connected. • The server and the monitor are turned on. 2. The keyboard is compatible with the server. Refer to the Web site at http://www.lenovo.com/thinkserver. 3. If you are using a USB keyboard and it is connected to a USB hub, disconnect the keyboard from the hub and connect it directly to the server. 4. Replace the following components one at a time, in the order shown, restarting the server each time: a. Keyboard b. (Trained service technician only) System board
The mouse or pointing device does not work.	1. Make sure that: • The mouse or pointing device is compatible with the server. Refer to the Web site at http://www.lenovo.com/thinkserver. • The mouse or pointing-device cable is securely connected to the server. • The mouse or pointing-device device drivers are installed correctly. • The server and the monitor are turned on. • The mouse is enabled in the Setup Utility program. 2. If you are using a USB mouse or pointing device and it is connected to a USB hub, disconnect the mouse or pointing device from the hub and connect it directly to the server. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Mouse or pointing device b. (Trained service technician only) System board

Memory problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.

- See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).
- If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.

Symptom	Action
The amount of system memory that is displayed is less than the amount of installed physical memory.	1. Make sure that: • No error LEDs are lit on the operator information panel or on the DIMM. • Memory mirroring does not account for the discrepancy. • The memory modules are seated correctly. • You have installed the correct type of memory. • If you changed the memory, you updated the memory configuration in the Setup Utility program. • All banks of memory are enabled. The server might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled. 2. Check the POST event log for DIMM error messages: • If a DIMM was disabled by a systems-management interrupt (SMI), replace the DIMM. • If a DIMM was disabled by the user or by POST, run the Setup Utility program and enable the DIMM. 3. Make sure that there is no memory mismatch when the server is at the minimum memory configuration. 4. Add one pair of DIMMs at a time, making sure that the DIMMs in each pair are matching. 5. Reseat the DIMMs. 6. Replace the DIMMs one at a time in the order and restart the server each time.
Multiple rows of DIMMs in a branch are identified as failing.	1. Reseat the DIMMs; then, restart the server. 2. Replace the lowest-numbered DIMMs with identical known good DIMMs; then, restart the server. Repeat as necessary. If the failures continue after all identified pairs are replaced, contact a trained service technician for help. 3. Return the removed DIMMs, one pair at a time, to their original connectors, restarting the server after each pair, until a pair fails. Replace each DIMM in the failed pair with an identical known good DIMM, restarting the server after you reinstall each DIMM. Replace the failed DIMM. Repeat these actions until you have tested all removed DIMMs. 4. (Trained service technician only) Replace the system board.

Microprocessor problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).
- If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.

Symptom	Action
The server emits a continuous beep during the POST, indicating that the startup (boot) microprocessor is not working correctly.	1. Make sure that the server supports all the microprocessors and that the microprocessors match in speed and cache size. 2. (Trained service technician only) Reseat microprocessor 1. 3. (Trained service technician only) If there is no indication of which microprocessor has failed, isolate the error by testing with one microprocessor at a time. 4. Replace the following components one at a time, in the order shown, restarting the server each time: a. (Trained service technician only) Microprocessor 2 b. VRM 2 c. (Trained service technician only) System board 5. (Trained service technician only) If multiple error codes indicate a microprocessor error, reverse the locations of two microprocessors to determine whether the error is associated with a microprocessor or with a microprocessor socket. • If the error is associated with a microprocessor, replace the microprocessor. • If the error is associated with a VRM, replace the VRM. • If the error is associated with a microprocessor socket, replace the system board.

Monitor problems

Some monitors have their own self-tests. If you suspect a problem with your monitor, see the documentation that comes with the monitor for instructions for testing and adjusting the monitor.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).
- If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.

Symptom	Action
Testing the monitor	1. Make sure that the monitor cables are firmly connected. 2. Try using a different monitor on the server, or try using the monitor that is being tested on a different server. 3. Run the diagnostic programs. If the monitor passes the diagnostic programs, the problem might be a video device driver. 4. (Trained service technician only) Replace the system board.
The screen is blank.	1. If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the monitor cable directly to the correct connector on the rear of the server. 2. Make sure that: • The server is turned on. If there is no power to the server, see "Power problems" on page 93. • The monitor cables are connected correctly. • The monitor is turned on and the brightness and contrast controls are adjusted correctly. • No POST errors are generated when the server is turned on. 3. Make sure that the correct server is controlling the monitor, if applicable. 4. See "Solving undetermined problems" on page 97.

Symptom	Action
The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.	1. If the monitor self-tests show that the monitor is working correctly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. **Attention:** Moving a color monitor while it is turned on might cause screen discoloration. Move the device and the monitor at least 305 mm (12 inches) apart, and turn on the monitor. To prevent diskette drive read/write errors, make sure that the distance between the monitor and any external diskette drive is at least 76 mm (3 inches). 2. Reseat the monitor. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Monitor b. (Trained service technician only) System board
Wrong characters appear on the screen.	1. If the wrong language is displayed, update the server firmware with the correct language (see “Updating the firmware” on page 84). 2. Reseat the monitor. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Monitor b. (Trained service technician only) System board

Optional-device problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Symptom	Action
A Lenovo optional device that was just installed does not work.	1. Make sure that: • The device is designed for the server. For a list of the supported options for your server, go to http://www.lenovo.com/thinkserver. On the ThinkServer systems page, click **Products → Options**. • You followed the installation instructions that came with the device and the device is installed correctly. • You have not loosened any other installed devices or cables. • You updated the configuration information in the Setup Utility program. Whenever memory or any other device is changed, you must update the configuration. 2. Reseat the device that you just installed. 3. Replace the device that you just installed.

Symptom	Action
A Lenovo optional device that used to work does not work now.	1. Make sure that all of the hardware and cable connections for the device are secure. 2. If the device comes with test instructions, use those instructions to test the device. 3. If the failing device is an SCSI device, make sure that: • The cables for all external SCSI devices are connected correctly. • The last device in each SCSI chain, or the end of the SCSI cable, is terminated correctly. • Any external SCSI device is turned on. You must turn on an external SCSI device before you turn on the server. 4. Reseat the failing device. 5. Replace the failing device.

Power problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).
- If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.

Symptom	Action
The power-control button does not work (the server does not start). **Note:** The power-control button will not function until 3 minutes after the server has been connected to ac power.	1. Make sure that the power-control button is working correctly: a. Disconnect the server power cords. b. Reconnect the power cords. c. (Trained service technician only) Reseat the operator information panel cables, and then disconnect the server power cords. Reconnect the power cords. If the server starts, reseat the operator information panel. If the problem remains, replace the operator information panel. 2. Make sure that: • The power cords are correctly connected to the server and to a working electrical outlet. • The type of memory that is installed is correct. • The DIMM is fully seated. • The LEDs on the power supply do not indicate a problem. • The microprocessors are installed in the correct sequence. 3. Reseat the following components: a. DIMMs b. (Trained service technician only) Power switch connector c. (Trained service technician only) Power backplane 4. Replace the following components one at a time, in the order shown, restarting the server each time: a. DIMMs b. (Trained service technician only) Power switch connector c. (Trained service technician only) Power backplane d. (Trained service technician only) System board 5. If you just installed an optional device, remove it, and restart the server. If the server now starts, you might have installed more devices than the power supply supports. 6. See “Solving undetermined problems” on page 97.
The server does not turn off.	1. Determine whether you are using an Advanced Configuration and Power Interface (ACPI) or a non-ACPI operating system. If you are using a non-ACPI operating system, do the following: a. Press Ctrl+Alt+Delete. b. Turn off the server by pressing the power-control button for 5 seconds. c. Restart the server. d. If the server fails the POST and the power-control button does not work, disconnect the power cord for 20 seconds; then, reconnect the power cord and restart the server. 2. If the problem remains or if you are using an ACPI-aware operating system, suspect the system board.
The server unexpectedly shuts down, and the LEDs on the operator information panel are not lit.	See “Solving undetermined problems” on page 97.

Serial port problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.

- See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).
- If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.

Symptom	Action
The number of serial ports that are identified by the operating system is less than the number of installed serial ports.	1. Make sure that: • Each port is assigned a unique address in the Setup Utility program and none of the serial ports is disabled. • The serial port adapter (if one is present) is seated correctly. 2. Reseat the serial port adapter. 3. Replace the serial port adapter.
A serial device does not work.	1. Make sure that: • The device is compatible with the server. • The serial port is enabled and is assigned a unique address. • The device is connected to the correct connector. 2. Reseat the following components: a. Failing serial device b. Serial cable 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Failing serial device b. Serial cable c. (Trained service technician only) System board

Software problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).
- If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.

Symptom	Action
You suspect a software problem.	1. To determine whether the problem is caused by the software, make sure that: • The server has the minimum memory that is needed to use the software. For memory requirements, see the information that comes with the software. If you have just installed an adapter or memory, the server might have a memory-address conflict. • The software is designed to operate on the server. • Other software works on the server. • The software works on another server. 2. If you receive any error messages while you use the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem. 3. Contact the software vendor.

Universal Serial Bus (USB) port problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Hardware Maintenance Manual* to determine which components are customer replaceable units (CRUs) and which components are field replaceable units (FRUs).
- If an action step is preceded by "(Trained service technician only)," that step must be performed only by a trained service technician.

Symptom	Action
A USB device does not work.	1. Make sure that: • The correct USB device driver is installed. • The operating system supports USB devices. • A standard PS/2 keyboard or mouse is not connected to the server. If it is, a USB keyboard or mouse will not work during the POST. 2. Make sure that the USB configuration optional devices are set correctly in the Setup Utility program. 3. If you are using a USB hub, disconnect the USB device from the hub and connect it directly to the server.

Solving power problems

Power problems can be difficult to solve. For example, a short circuit can exist anywhere on any of the power distribution buses. Usually, a short circuit will cause the power subsystem to shut down because of an overcurrent condition. To diagnose a power problem, use the following general procedure:

1. Turn off the server and disconnect all ac power cords.
2. Check for loose cables in the power subsystem. Also check for short circuits, for example, if a loose screw is causing a short circuit on a circuit board.
3. Remove the adapters and disconnect the cables and power cords to all internal and external devices until the server is at the minimum configuration that is required for the server to start (see "Solving undetermined problems" on page 97 for the minimum configuration).
4. Reconnect all ac power cords and turn on the server. If the server starts successfully, replace the adapters and devices one at a time until the problem is isolated.

If the server does not start from the minimum configuration, replace the components in the minimum configuration one at a time until the problem is isolated.

Solving Ethernet controller problems

The method that you use to test the Ethernet controller depends on which operating system you are using. See the operating-system documentation for information about Ethernet controllers, and see the Ethernet controller device-driver readme file.

Try the following procedures:

- Make sure that the correct device drivers, which come with the server, are installed and that they are at the latest level.
- Make sure that the Ethernet cable is installed correctly.
  - The cable must be securely attached at all connections. If the cable is attached but the problem remains, try a different cable.
  - If the Ethernet controller is set to operate at 100 Mbps, you must use Category 5 cabling.

  - If you directly connect two servers (without a hub), or if you are not using a hub with X ports, use a crossover cable. To determine whether a hub has an X port, check the port label. If the label contains an X, the hub has an X port.
- Determine whether the hub supports auto-negotiation. If it does not, try configuring the integrated Ethernet controller manually to match the speed and duplex mode of the hub.
- Check the Ethernet controller LEDs on the rear panel of the server. These LEDs indicate whether there is a problem with the connector, cable, or hub.
  - The Ethernet link status LED is lit when the Ethernet controller receives a link pulse from the hub. If the LED is off, there might be a defective connector or cable or a problem with the hub.
  - The Ethernet transmit/receive activity LED is lit when the Ethernet controller sends or receives data over the Ethernet network. If the Ethernet transmit/receive activity LED is off, make sure that the hub and network are operating and that the correct device drivers are installed.
- Check the LAN activity LEDs on the rear of the server. The LAN activity LED is lit when data is active on the Ethernet network. If the LAN activity LED is off, make sure that the hub and network are operating and that the correct device drivers are installed.
- Check for operating-system-specific causes of the problem.
- Make sure that the device drivers on the client and server are using the same protocol.

If the Ethernet controller still cannot connect to the network but the hardware appears to be working, the network administrator must investigate other possible causes of the error.

Solving undetermined problems

If the diagnostic tests did not diagnose the failure or if the server is inoperative, use the information in this section.

If you suspect that a software problem is causing failures (continuous or intermittent), see “Software problems” on page 95.

Damaged data in CMOS memory or damaged firmware can cause undetermined problems. To reset the CMOS data, use the password switch 2 (SW4) to override the power-on password and clear the CMOS memory; see “Locating parts on the system board” on page 14.

Check the LEDs on all the power supplies. If the LEDs indicate that the power supplies are working correctly, do the following:

1. Turn off the server.
2. Make sure that the server is cabled correctly.
3. Remove or disconnect the following devices, one at a time, until you find the failure. Turn on the server and reconfigure it each time.
   - Any external devices
   - Surge-suppressor device (on the server)
   - Modem, printer, mouse, and non-Lenovo devices
   - Each adapter
   - Hard disk drives
   - Memory modules: the minimum configuration requirement is 1 GB DIMM per microprocessor (2 GB in a two-microprocessor configuration)

   The following minimum configuration is required for the server to start:

   - One microprocessor
   - One 1 GB DIMM
   - One power supply

- Power cord
- ServeRAID SAS adapter
- System board assembly

4. Turn on the server. If the problem remains, suspect the following components in the following order:
   a. Power supply
   b. Power-supply cage
   c. Memory
   d. Microprocessor
   e. System board

If the problem is solved when you remove an adapter from the server but the problem recurs when you reinstall the same adapter, suspect the adapter; if the problem recurs when you replace the adapter with a different one, suspect the system board or extender card.

If you suspect a networking problem and the server passes all the system tests, suspect a network cabling problem that is external to the server.

Event logs

Error codes and messages are displayed in the following types of event logs:

- **POST event log:** This log contains the three most recent error codes and messages that were generated during the POST.
- **System-event log:** This log contains all the POST and system management interrupt (SMI) events. You can view the system-event log through the Setup Utility program and through the as the IPMI event log.The system-event log is limited in size. When it is full, new entries will not overwrite existing entries; therefore, you must periodically save and then clear the system-event log through the Setup Utility program. When you are troubleshooting, you might have to save and then clear the system-event log to make the most recent events available for analysis.

  Messages are listed on the left side of the screen, and details about the selected message are displayed on the right side of the screen. To move from one entry to the next, use the Up Arrow (↑) and Down Arrow (↓) keys.

Viewing event logs without restarting the server

If the server is not hung, methods are available for you to view one or more event logs without restarting the server.

If IPMItool is installed in the server, you can use it to view the system-event log. Most recent versions of the Linux operating system come with a current version of IPMItool.

The following table describes the methods that you can use to view the event logs, depending on the condition of the server. The first two conditions generally do not require that you restart the server.

Table 30. Methods for viewing event logs

Condition	Action
The server is not hung and is connected to a network.	Use IPMItool to view the system-event log.
The server is not hung and is not connected to a network.	Use IPMItool locally to view the system-event log.
The server is hung.	You can restart the server and press Del to start the Setup Utility program and view the system-event log.

System event log

The system-event log contains messages of three types:

Information	Information messages do not require action; they record significant system-level events, such as when the server is started.
Warning	Warning messages do not require immediate action; they indicate possible problems, such as when the recommended maximum ambient temperature is exceeded.
Error	Error messages might require action; they indicate system errors, such as when a fan is not detected.

Each message contains date and time information, and it indicates the source of the message (POST).

Diagnostic LEDs on the front control panel

Identifying the diagnostic LEDs on the front control panel is a very important method for diagnosing server problems. See “Front control panel” on page 11 for detailed information.

Onboard debug digitron

The onboard debug digitron helps trained service technicians to identify server problems. When you turn on the server, the onboard debug digitron will display debug code on the screen.

Appendix A. RAID battery card assembly

Specifications

The following table provides specifications of the RAID battery card assembly.

Battery technology	LiON
Battery operating temperature (ambient)	10 to 45°C (50 to 113°F)
Humidity (storage and operating)	20%-80% (non-condensing)
Battery storage temperature	Depends on storage time, as follows: • < 30 days: 0 to 50°C (32 to 122°F) • 30–90 days: 0 to 40°C (32 to 104°F) • > 90 days: 0 to 30°C (32 to 86°F)
Battery voltage conditioning	<3.7 V
Fast charge rate	500 mAh
Battery pack	1 cell
Mechanical	3.595 inches x 2.055 inches (8708ELP SAS RAID Controller battery) 2.61 inches x 2.122 inches (8708EM2 SAS RAID Controller Battery)
Battery capacity	1350 mAh (8708ELP SAS RAID Controller battery) 700 mAh (8708EM2 SAS RAID Controller Battery)
Charge circuitry card	Yes
Battery charge time	4 hours
Auxiliary power	Yes

Battery life and data retention time

This sections includes information about the battery life and data retention time.

It is recommended that you replace the battery pack on the battery card assembly once a year or after 500 recharging cycles, whichever comes first.

The data retention time for the battery card assembly is as follows:

BBU name	**Data retention time**
ThinkServer 8708ELP SAS RAID Adapter Battery (iBBU05)	• 72 hours for 256 Mbytes, using five 32Mx16 parts DDR2 (double-data-rate two) (low power) • 72 hours for 256 Mbytes, using three 64Mx16 parts DDR2 (low power)
ThinkServer 8708EM2 SAS RAID Controller Battery	72 hours for 256 Mbytes, using three 64 Mx16 DDR2 parts (low power)

The data retention time varies according to the following:

- Capacity of the battery pack and the battery load

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- Ambient temperature
- Age of the battery
- Numbers of discharge cycles the battery has been through
- DRAM (dynamic random access memory) size

Appendix B. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you. This section contains information about where to go for additional information about Lenovo and Lenovo products, what to do if you experience a problem with your system, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Hardware Maintenance Manual*.
- Go to http://www.lenovo.com/support to check for technical information, hints, tips, and new device drivers or to submit a request for information.

You can solve many problems without outside assistance by using the information available on the Lenovo Support site or by following the troubleshooting procedures that Lenovo provides in the documentation that is provided with your Lenovo product. The documentation that comes with Lenovo systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Using the documentation

Information about your Lenovo system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. Most of the documentation for your server is on the *ThinkServer Documentation DVD* provided with your server. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. Lenovo maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.lenovo.com/support and follow the instructions.

Getting help and information from the World Wide Web

On the World Wide Web, the Lenovo Web site has up-to-date information about Lenovo systems, optional devices, services, and support. For general information about Lenovo products or to purchase Lenovo products, go to http://www.lenovo.com. For support on Lenovo products, go to: http://www.lenovo.com/support

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Lenovo Support Web site

Technical support information is available at:
http://www.lenovo.com/support

This portal is updated with the latest information about the following subjects:

Downloads and Drivers	Download drivers, flash BIOS, and update your software.
Warranty	Check your warranty status and upgrade your warranty.
Technical Support	Click **Need Help?** for self-help tips to help diagnose a problem.
ThinkVantage	Learn more about ThinkVantage software to improve productivity and reduce cost.
Lenovo Forums	Search the community knowledge base for your computer to share and discover information with other users.
User Guides & Manuals	Read or print any publications related to your product.

Calling for service

During the warranty period, you can get help and information by telephone through the Customer Support Center.

These services are available during the warranty period:

- **Problem determination -** Trained personnel are available to assist you with determining a hardware problem and deciding what action is necessary to fix the problem.
- **Hardware repair -** If the problem is caused by hardware under warranty, trained service personnel are available to provide the applicable level of service.
- **Engineering Change management -** There might be changes that are required after a product has been sold. Lenovo or your reseller will make selected Engineering Changes (ECs) available that apply to your hardware.

These items are not covered by the warranty:

- Replacement or use of parts not manufactured for or by Lenovo or non-warranted Lenovo parts
- Identification of software problem sources
- Configuration of the BIOS as part of an installation or upgrade
- Changes, modifications, or upgrades to device drivers
- Installation and maintenance of network operating systems (NOS)
- Installation and maintenance of application programs

Refer to the safety and warranty information that is provided with your computer for a complete explanation of warranty terms. You must retain your proof of purchase to obtain warranty service.

For a list of service and support phone numbers for your country or region, go to http://www.lenovo.com/support and click **Support phone list** or refer to the safety and warranty information provided with your computer.

Note: Phone numbers are subject to change without notice. If the number for your country or region is not provided, contact your Lenovo reseller or Lenovo marketing representative.

If possible, be at your computer when you call. Have the following information available:

- Machine type and model
- Serial numbers of our hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

Using other services

If you travel with a Lenovo notebook computer or relocate your computer to a country where your desktop, notebook, or server machine type is sold, your computer might be eligible for International Warranty Service, which automatically entitles you to obtain warranty service throughout the warranty period. Service will be performed by service providers authorized to perform warranty service.

Service methods and procedures vary by country, and some services might not be available in all countries. International Warranty Service is delivered through the method of service (such as depot, carry-in, or on-site service) that is provided in the servicing country. Service centers in certain countries might not be able to service all models of a particular machine type. In some countries, fees and restrictions might apply at the time of service.

To determine whether your computer is eligible for International Warranty Service and to view a list of the countries where service is available, go to http://www.lenovo.com/support, click **Warranty**, and follow the instructions on the screen.

For technical assistance with the installation of, or questions related to, Service Packs for your preinstalled Microsoft Windows product, refer to the Microsoft Product Support Services Web site at http://www.support.microsoft.com/directory/, or you can contact the Customer Support Center. Some fees might apply.

Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for hardware, operating systems, and application programs; network setup and configuration; upgraded or extended hardware repair services; and custom installations. Service availability and service name might vary by country or region. For more information about these services, go to the Lenovo Web site at http://www.lenovo.com/.

Lenovo product service information for Taiwan

台灣 Lenovo 產品服務資訊如下：
荷蘭商聯想股份有限公司台灣分公司
台北市信義區信義路五段七號十九樓之一
服務電話：0800-000-702

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Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

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Important notes

Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1024 bytes, MB stands for 1,048,576 bytes, and GB stands for 1,073,741,824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1,000,000 bytes, and GB stands for 1,000,000,000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives that are available from Lenovo.

Maximum memory might require replacement of the standard memory with an optional memory module.

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Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

Product recycling and disposal

This unit must be recycled or discarded according to applicable local and national regulations. Lenovo encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. Lenovo offers a variety of programs and services to assist equipment owners in recycling their IT products. Information on Lenovo product recycling offerings can be found on Lenovo's Internet site at http://www.lenovo.com/lenovo/environment/recycling.

Esta unidad debe reciclarse o desecharse de acuerdo con lo establecido en la normativa nacional o local aplicable. Lenovo recomienda a los propietarios de equipos de tecnología de la información (TI) que reciclen

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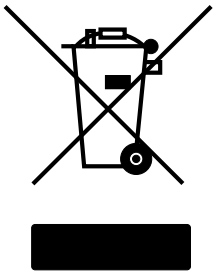
http://www.lenovo.com/lenovo/environment/recycling.



EU Only

Notice: This mark applies only to countries within the European Union (EU) and Norway.

This appliance is labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

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Remarque : Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'etiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown above, must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and recovery of WEEE. Customer participation is important to minimize any potential effects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local Lenovo representative.

Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server that is described in this document. Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the server to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are

set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If Lenovo determines that the levels of particulates or gases in your environment have caused damage to the server, Lenovo may condition provision of repair or replacement of servers or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 31. Limits for particulates and gases

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days

[1] ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

[2] The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.

[3] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

Turkish statement of compliance

The Lenovo product meets the requirements of the Republic of Turkey Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (EEE).

Türkiye EEE Yönetmeliğine Uygunluk Beyanı

Bu Lenovo ürünü, T.C. Çevre ve Orman Bakanlığı'nın "Elektrik ve Elektronik Eşyalarda Bazı Zararlı Maddelerin Kullanımının Sınırlandırılmasına Dair Yönetmelik (EEE)" direktiflerine uygundur.

EEE Yönetmeliğine Uygundur.

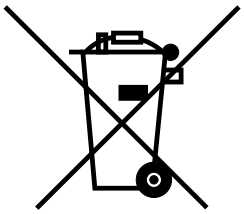
Battery return program

This product may contain a lithium or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal or batteries outside the United States, go to http://www.lenovo.com/lenovo/environment or contact your local waste disposal facility.

US & Canada Only

廢電池請回收

EU



Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

Les batteries ou emballages pour batteries sont étiquetés conformément aux directives européennes 2006/66/EC, norme relative aux batteries et accumulateurs en usage et aux batteries et accumulateurs usés. Les directives déterminent la marche à suivre en vigueue dans l'Union Européenne pour le retour et le recyclage des batteries et accumulateurs usés. Cette étiquette est appliquée sur diverses batteries pour indiquer que la batterie ne doit pas être mise au rebut mais plutôt récupérée en fin de cycle de vie selon cette norme.

In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury, and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances. For proper collection and treatment, go to http://www.lenovo.com/lenovo/environment.

For California:

Perchlorate material - special handling may apply. See http://www.dtsc.ca.gov/hazardouswaste/perchlorate/.

The foregoing notice is provided in accordance with California Code of Regulations Title 22, Division 4.5 Chapter 33. Best Management Practices for Perchlorate Materials. This product/part may include a lithium manganese dioxide battery which contains a perchlorate substance.

German Ordinance for Work gloss statement

The product is not suitable for use with visual display work place devices according to clause 2 of the German Ordinance for Work with Visual Display Units.

Das Produkt ist nicht für den Einsatz an Bildschirmarbeitsplätzen im Sinne § 2 der Bildschirmarbeitsverordnung geeignet.

Electronic emission notices

The following information applies to Lenovo ThinkServer RD240 server machine types 1045, 1046, 1047, and 1048.

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Lenovo is not responsible for any radio or television interference caused by using other than specified or

recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

United Kingdom telecommunications safety requirement

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

European Union - Compliance to the Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. Lenovo cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the installation of option cards from other manufacturers.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

CE

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

German Class A compliance statement

Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit
Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der Lenovo empfohlene Kabel angeschlossen werden. Lenovo übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der Lenovo verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der Lenovo gesteckt/eingebaut werden.

Deutschland:

Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Betriebsmittein
Dieses Produkt entspricht dem „Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln“ EMVG (früher „Gesetz über die elektromagnetische Verträglichkeit von Geräten“). Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln, EMVG vom 20. Juli 2007 (früher Gesetz über die elektromagnetische Verträglichkeit von Geräten), bzw. der EMV EG Richtlinie 2004/108/EC (früher 89/336/EWG), für Geräte der Klasse A.

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung nach Paragraf 5 des EMVG ist die Lenovo (Deutschland) GmbH, Gropiusplatz 10, D-70563 Stuttgart.

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:
Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

Nach der EN 55022: „Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen.“

Nach dem EMVG: „Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind, nur mit besonderer Genehmigung des Bundesministers für Post und Telekommunikation oder des Bundesamtes für Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Störungen zu erwarten sind.“ (Auszug aus dem EMVG, Paragraph 3, Abs. 4). Dieses Genehmigungsverfahren ist nach Paragraph 9 EMVG in Verbindung mit der entsprechenden Kostenverordnung (Amtsblatt 14/93) kostenpflichtig.

Anmerkung: Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den Handbüchern angegeben, zu installieren und zu betreiben.

Korea Class A compliance statement

방송통신기자재 사용자 안내문
이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Japan VCCI Class A compliance statement

この装置は, クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI－A

Japan compliance statement for products which connect to the power mains with rated current less than or equal to 20 A per phase

日本の定格電流が 20A/相 以下の機器に対する高調波電流規制
高調波電流規格 JIS C 61000-3-2 適合品

China Class A compliance statement

声明
此为A级产品。在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

Taiwan Class A compliance statement

警告使用者
此為甲類資訊技術設備，於居住環境中使用時，可能會造成射頻擾動，在此種情況下，使用者會被要求採取某些適當的對策。

Lenovo product service information for Taiwan

台灣 Lenovo 產品服務資訊如下：
荷蘭商聯想股份有限公司台灣分公司
台北市信義區信義路五段七號十九樓之一
服務電話：0800-000-702

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